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BRITISH MUSEUM NATURAL HISTORY.

TUTE SI·RECTE·VIXERIS

PHILOSOPHICAL TRANSACTIONS.

Giving ſome

ACCOUNT

OF THE

Preſent Undertakings, Studies and Labours

OF THE

INGENIOUS,

In many

Conſiderable Parts of the World.

VOL. XXIII. For the Years 1702 and 1703.

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BRITISH MUSEUM
NATURAL HISTORY

TO

Iſaac Newton, Eſq;

PRESIDENT;

AND TO THE

Council and Fellows

OF THE

ROYAL SOCIETY

OF

LONDON,

For the Advancement of

NATURAL KNOWLEDGE;

This Three and Twentieth Volume

OF THE

Philoſophical Tranſactions,

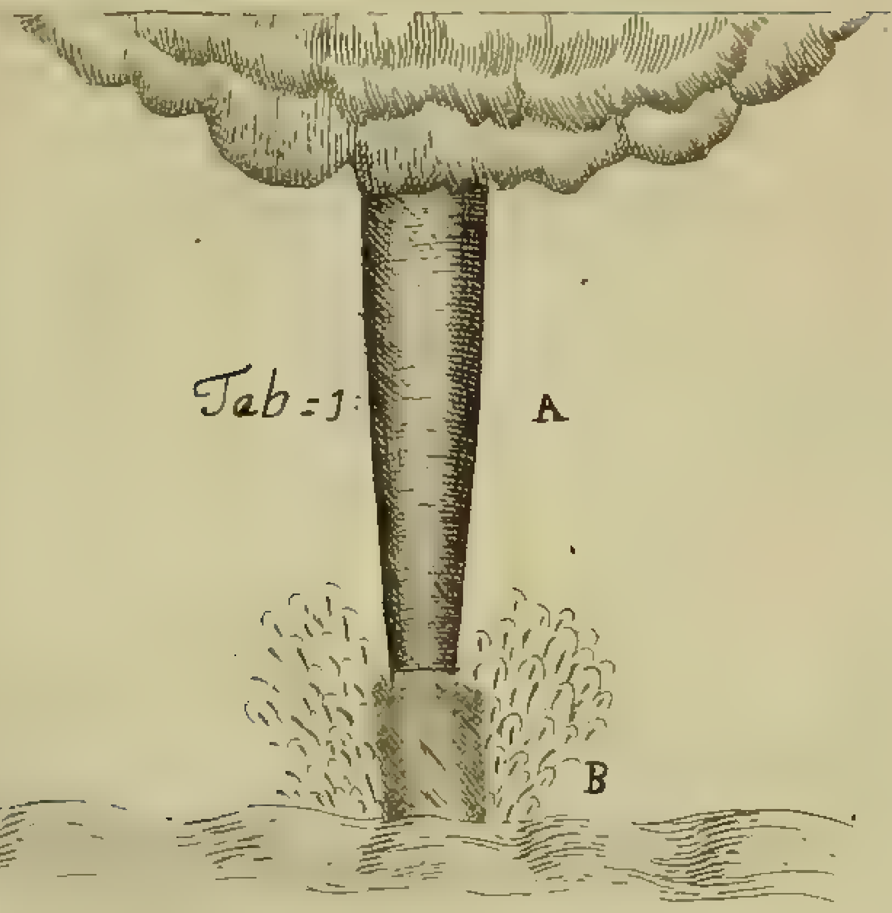
Is humbly Dedicated by

Their moſt Obedient Servant,

Hans Sloane, S. R. Secr.

BRITISH MUSEUM NATURAL HISTORY.

Philos:Transact:N°:277: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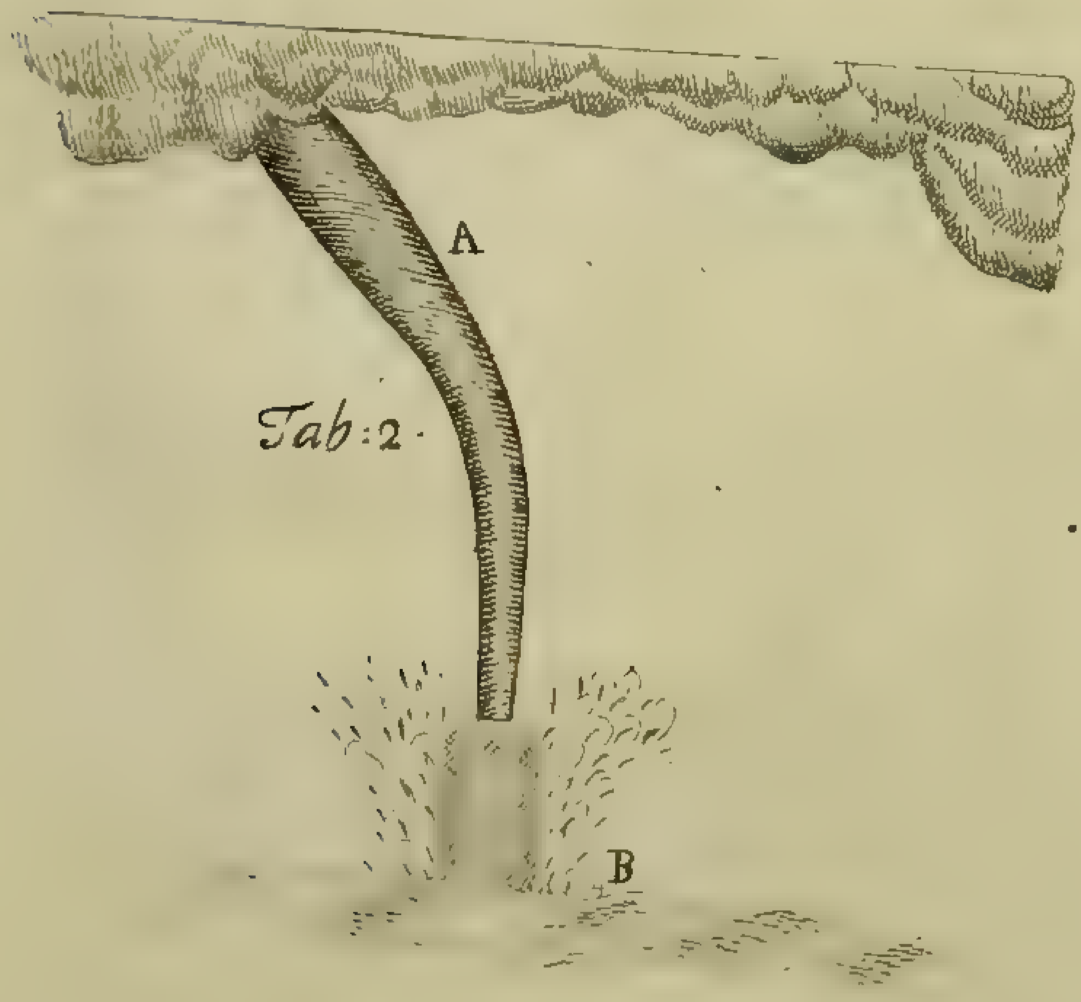
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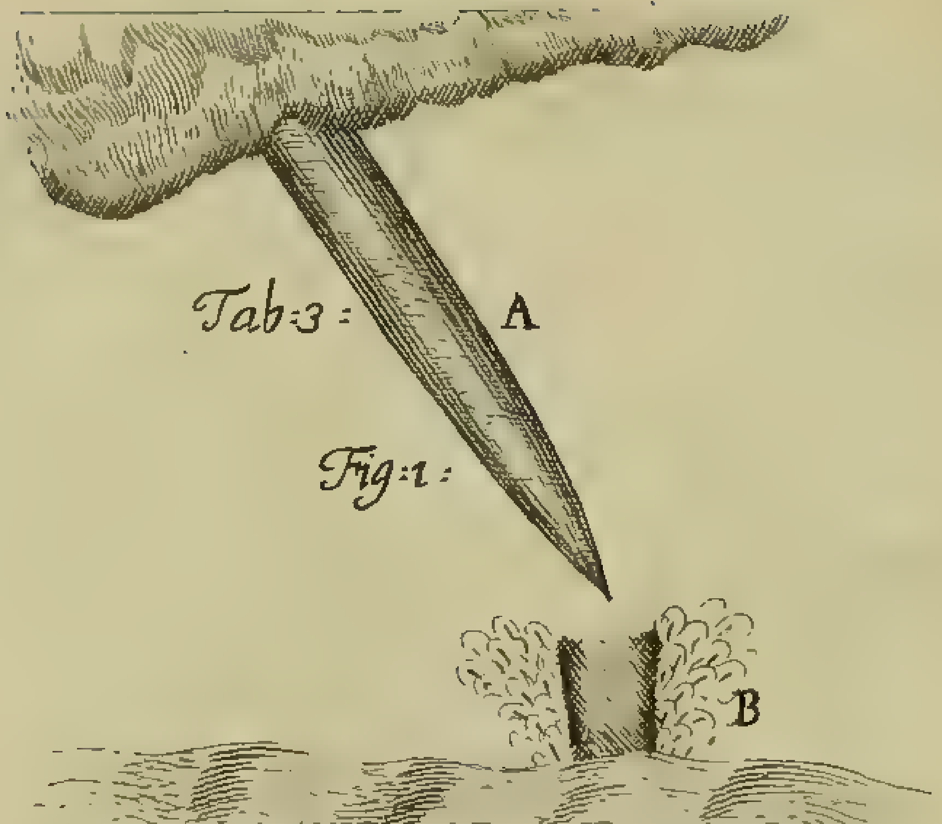
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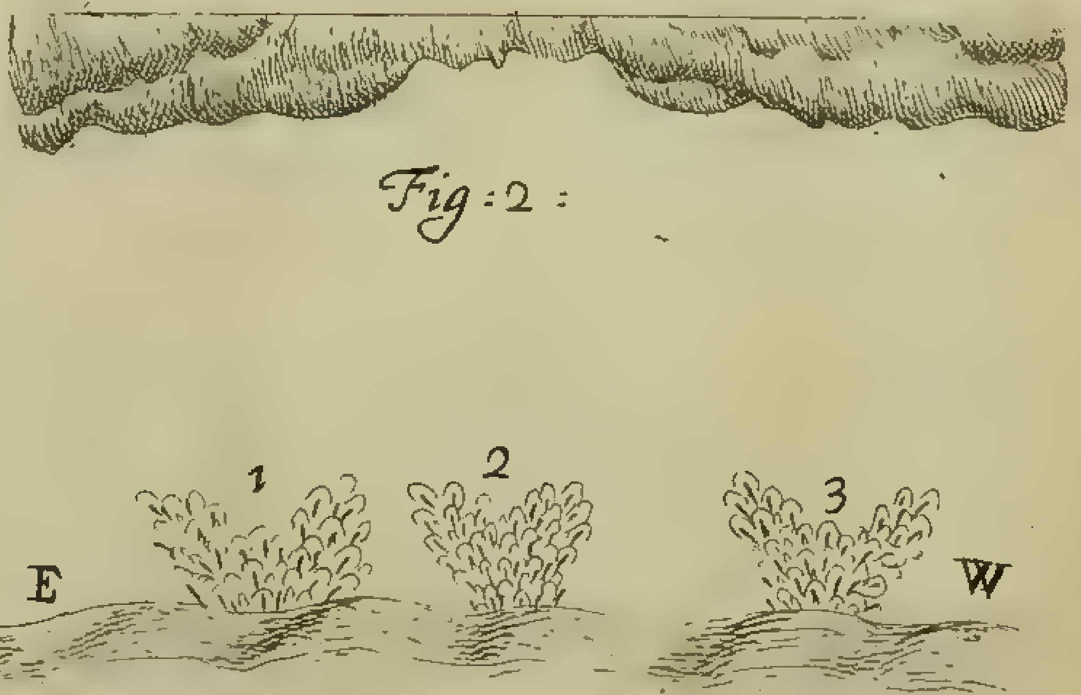
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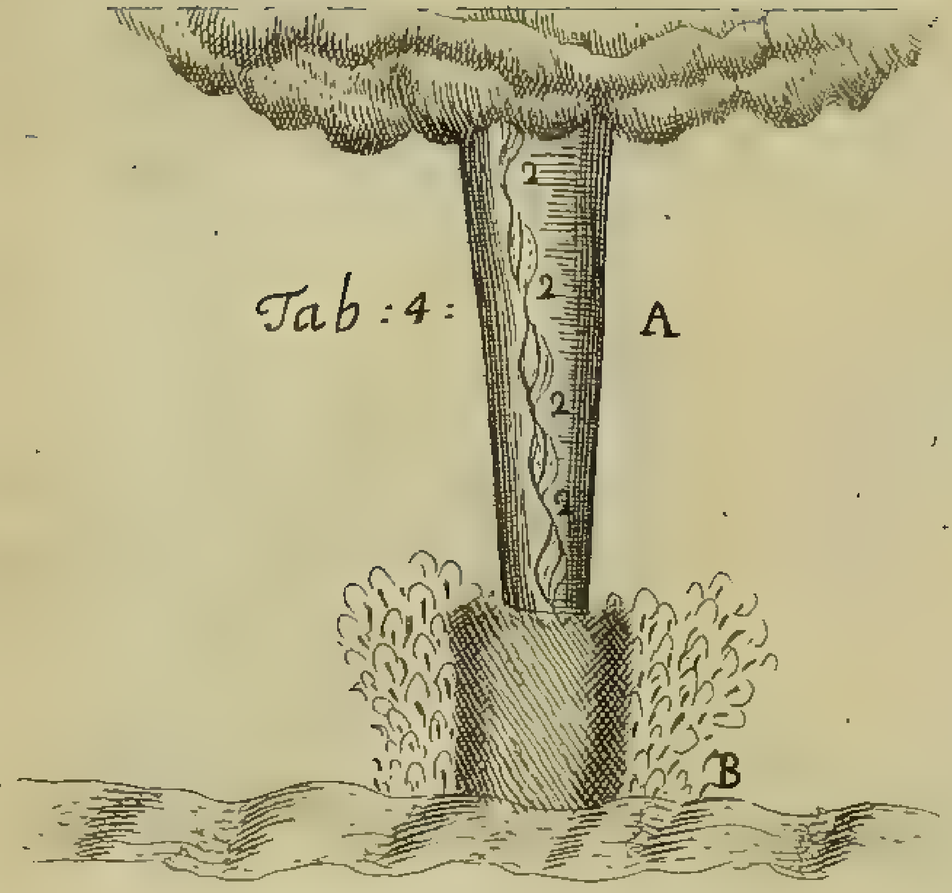
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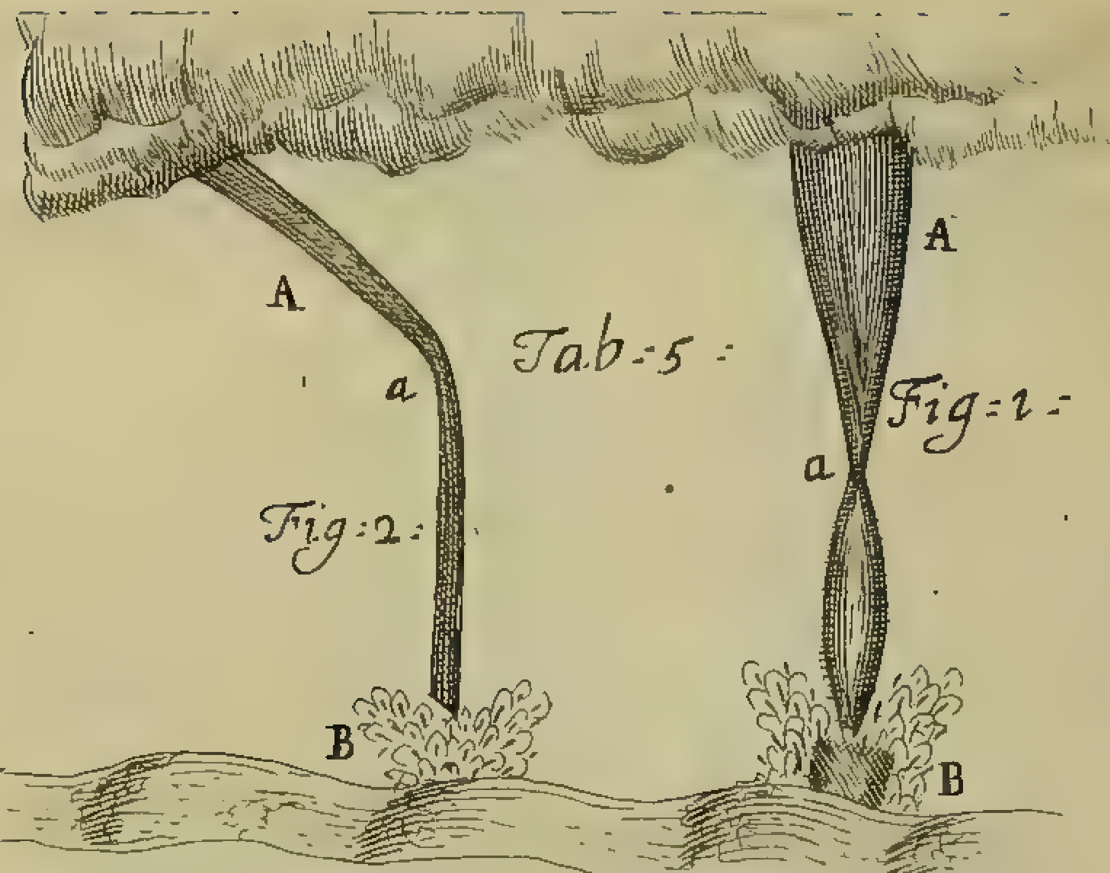
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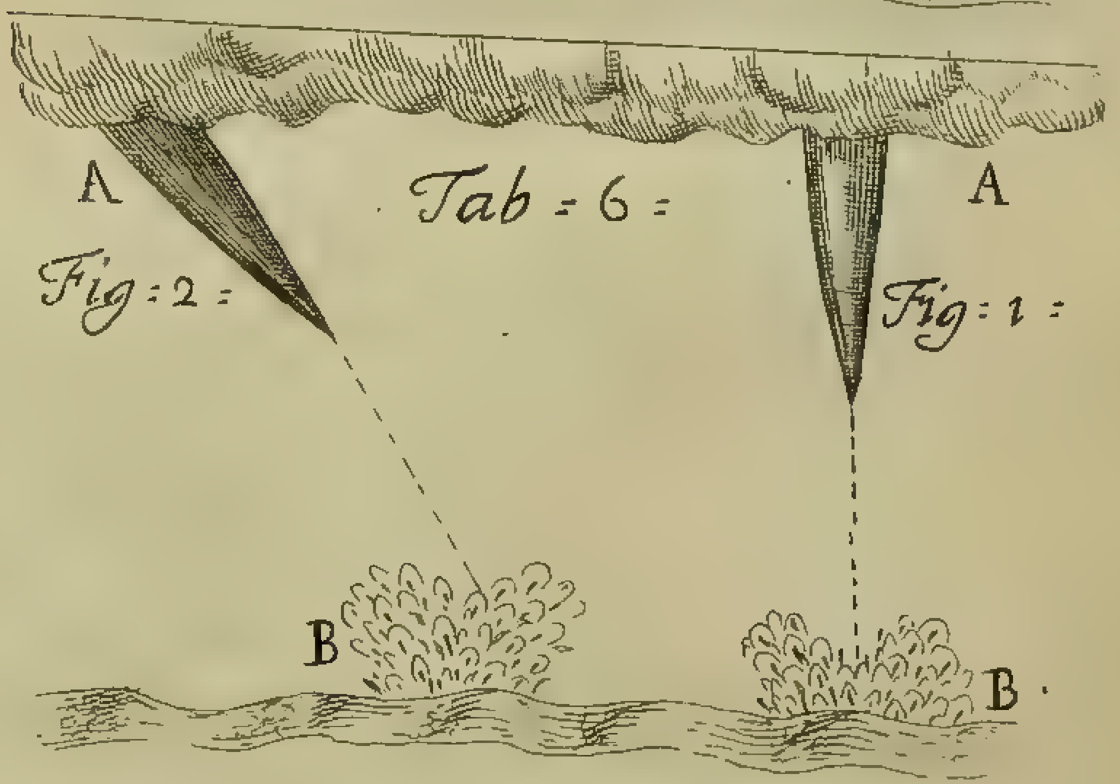
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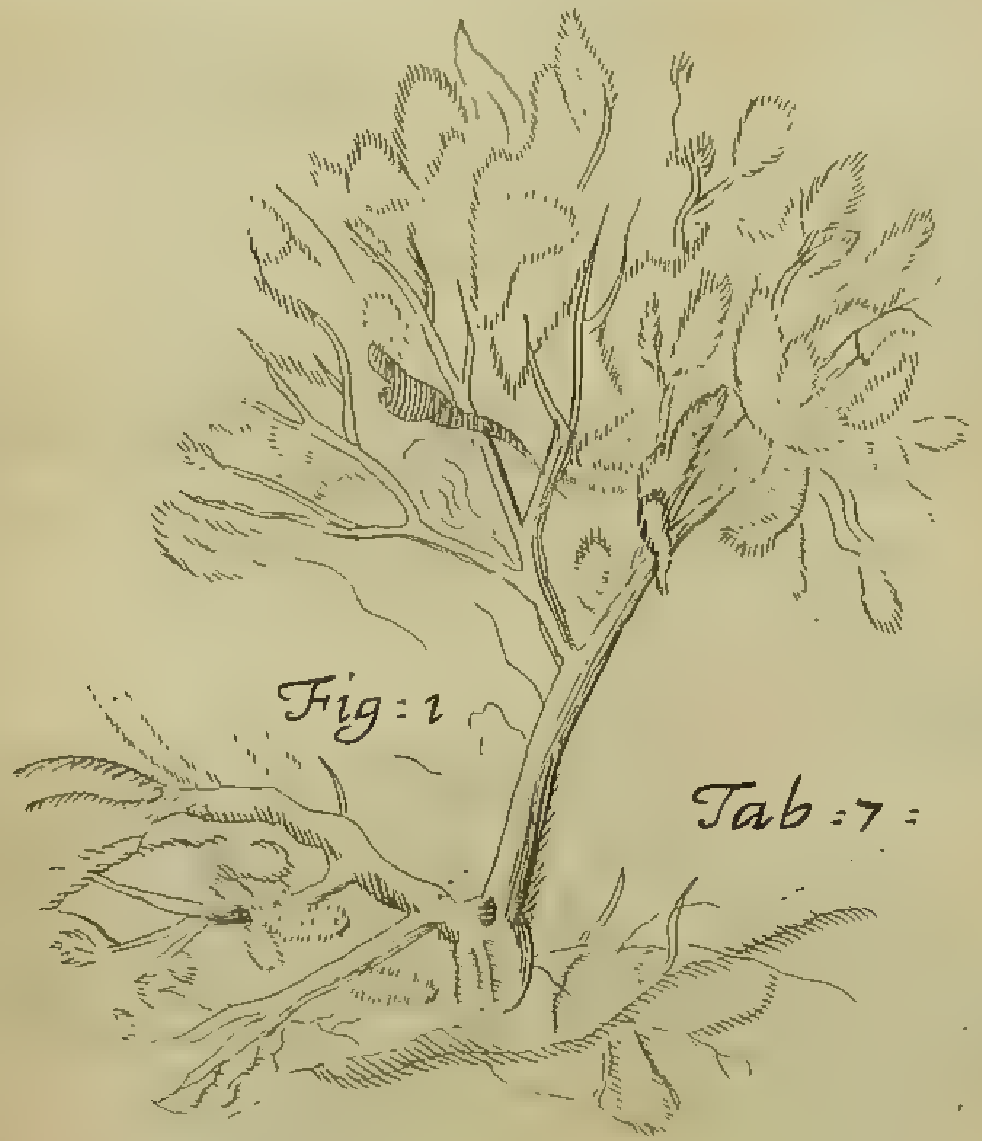
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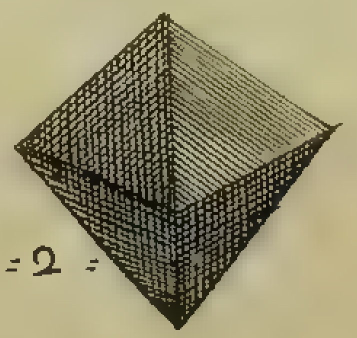
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(Numb. 277.)

PHILOSOPHICAL TRANSACTIONS.

For the Months of January *and* February, 1702.

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VI. An Account of a Book, *viz.*

Edmundi Dickenſoni M. D. Phyſica vetus & vera, ſive, Tractatus de Naturali veritate hexameri Moſaici. Per quem Probatur in hiſtoria Creationis cum generationis Univerſæ methodum atq; modum, tum veræ Philoſophiæ principia, ſtrictim atq; Breviter tradi. Londini 1702. in 4o.

I. *An*

I. *An Account of the taking and taming of Elephants in* Zeylan, *by Mr* Strachan, *a Phyſician, who lived* 17 *years there.*

ALL the Natives within 20 miles from the Sea-coaſt betwixt *Matura* and *Negumbo* are ſubject to the *Hollanders*, and know the Duty and Service which their *Eaſt-India* Company requires of them; therefore when Orders are given to hunt the Elephants, they pitch upon a convenient place for a Warrant or Park, which is broad at the entrance, and turn the farther in the more narrow, ſo that at the end it is ſo narrow that an Elephant cannot turn himſelf; yet this narrow place is ſo long, that 20 Elephants may ſtand one behind another. The Park being perfected, the *Koolrale*, who is the Head or Chief of the *Kool* (which is to ſay in *Engliſh* a Shire) does Order the Inhabitants who dwell thereabout to their places, who make a Circumference about the Woods, where they know that Elephants are, which will be the length of 60 *Engliſh* miles. At firſt one man ſtand from another at the diſtance of about 5 poles, or 25 yards, and kindles Fire in the ſpaces between them, then by ſhooting, crying, beating of Drums, ſounding of Horns, the Elephants retire towards the Park, and ſo from time to time the Men follow, ſhooting and making a noiſe, until the Circumference be ſo little, that they ſtand upon one anothers ſide. The Elephants, when they find themſelves incloſed within the Park, make more reſiſtance, ſome turning back upon the Men, but Poſts are ready ſtanding betwixt the Men and the Elephants, and long Stakes lying upon the ground, they have only to lift theſe Stakes, and make the ends of theſe Stakes faſt to the Poſts, and thus the Elephants are encloſed within the Park. Then by following the Elephants, and caſting of Fire-brands, they chaſe them ſtill farther toward the end of the Park, and cloſing up the paſſage behind them, by ſetting up, and laying Stakes athwart the Poſts, until at laſt they are all entered into the narrow place, where they cannot turn themſelves. But becauſe there are many ſorts of Elephants, ſome being a great deal higher before than behind, and many who never have the two long Teeth; others are of a more ſavage Nature, which are known by their Eyes and Face, having a fierce Tyger-look, and will be for no ſervice, although they be kept 10 years: ſuch ones the King of *Candie* keeps for puniſhing of Tranſgreſſors, for they kill all perſons that come within their reach. One of them the late King of *Candie* (who never in all his life after the *Hollanders* had beat the *Portugueſes* from *Zeilan*, and not performing their promiſe to that King, who had been a great help to the *Hollanders* in that War) ſent to the *Hollanders* when I was there, in recompence of ſome Preſents, which the *Hollanders* had ſent to move him to Peace; among which Preſents a Lyon from the *Cape of Good Hope* was ſent, as being the King of all other Beaſts, but he never would let theſe Preſents come within 20 miles of his preſence; the *Hollanders* kept the ſame Elephant in a place by himſelf ſtill tyed, being at great pains every day to bring him to the Water ſide betwixt two tame Elephants, the *Hollanders* intending to ſhew the regard they had to that Kings Gifts. Such like Elephants being among the other Elephants in the fore-mention'd Park, are kept out of the narrow entrance by caſting Firebrands upon them when they draw near the narrow entrance, and endeavour to kill them by Guns, and cutting off their Snout, by which they take all their Victuals; which being cut, they periſh for hunger when they are eſcap'd, for the Natives being very ſwift will come very near them with their Swords. When all the choice of the Elephants are entered into the narrow paſſage, there are Poſts put athwart, ſo that none can come back; the reſt that are not fit for ſervice have liberty to eſcape.

It is eaſie to conceive how the Natives did invent the chaſing Elephants by Drums and Noiſe, becauſe it is obſerved that they themſelves are affrighted by Drums. I did hear an Ancient *Portugueſe* relating, that when his Country-men were in poſſeſſion of this Iſland, they did purſue the Natives too far up among the Woods and Hills, the *Ceiloneſes* by this means got the advantage of the *Portugueſe*, and killed every man of them except one Drummer, who did obſerve them not to draw near where they did hear the Drum, he therefore beat upon his Drum continually; the *Ceiloneſes* thinking that the greateſt power was where the Drum did beat, did not come near him, and by this means he ſaved his life.

When the Elephants have been a while ſettled in the narrow paſſage, they are one by one taken to the Stable, being tyed faſt between two tame Elephants bred for that purpoſe, the point of whoſe long Teeth are cut: If the wild Elephant be troubleſome, they will hold his Trunk with their Trunk, and beat him with their Teeth, a Man ſitting upon each of the tame Elephants, to direct them by a Staff, upon the end of which is a little Hook, wherewith he touches his Head, and orders the tame Elephant as he pleaſes, without a Bridle, or the like. When they come into the Stable, they are led betwixt two Poſts, and Stakes put athwart before their Breaſts and under their Bellies, and ſo tyed that they cannot ſtir, nor lye down upon the ground; for if they ſhould be permitted to lye down they would turn heavy, ſorrowful, and would not eat, and dye. They are this way fed and nouriſhed with the Trunk of *Waltugas*, or *Plantains*. The Trunk of this Tree they love better than any other food, and with theſe Trunks they are fed in the Ships; when they have been nouriſht ſo ſix weeks they begin to be tractable, and are faſtened only with one foot tyed with Cords; and if the Merchants come from *Bengal* they are ſold and convey'd to the Ships; if the Merchants have no uſe for them, or that they cannot agree about the price, they feed them with Leaves of the *Coco* Tree, until 12 weeks be paſt after their being taken, and then they are as tame as a Dog, and eat Graſs with the Oxen in the Fields.

When the Elephants are put on board the Ships, there is a thing prepar'd of 15 or 20 double Sailcloath, which is laid about his Breaſt, Belly and Sides, and is tyed together upon his Back, whereunto Ropes are faſtened, then he is led into the Water betwixt Elephants bred for the purpoſe, upon which a Man ſits to govern him, and another Elephant (upon which ſits a Man) goes behind the Elephant that is to be ſhipp'd, and when this Elephant is unwilling to enter the Water, the Elephant that is behind puts his Head to the foremoſt's hinderparts, and preſſes him forward, which will cauſe any perſon to laugh to behold the ſame; when he is got deep enough in the Water he is tyed to the Boat, the other Elephants return, and he ſwims after the Boat to the Ship, where he is haled over into the Ship.

But there is lately invented a more convenient way, which is thus: There is prepared a big Veſſel, flat bottom'd, cover'd with Planks like a floor, ſo that this floor is almoſt of the height of the Key, then the ſide of the Key and the Veſſel are adorned with Green Branches, ſo that the Elephant does ſee no Water till he be in the Ship.

When one Elephant ſwims to the Ship, or otherwiſe croſſes a deep River, nothing of him can be ſeen only his Snout thorough which he breathes: and when he is waſhed upon a River ſide, he ordinarily lyes with his Head upon the bottom of the Water flat alike with his Body, and although one ſide of him be above Water, his Head will be under, holding only his Snout above Water through which he breathes.

When the Elephants are tame, they are very docil and tractable, ſo that they will lye upon their Belly when Men are to get up and ride upon them.

If they fall at any time, altho upon even ground, they either dye immediately, or languiſh after that until they dye: their Body being of ſo great a bulk, is the cauſe of the harm they get by a fall.

If an Elephant frequents a Plantation of Fruit-Trees of the Natives, for no Hedges can keep him out, they make a point upon a heavy piece of Wood, and hangs it on a branch of a Tree under which the Elephant uſes to come; and at night a Man ſits watching upon that Branch, and when the Elephant comes under the Branch the Man cuts the Cord, and ſo the point of the Wood falls a foot deep in his Back, by which means the Elephant languiſhes and dyes; but when the *Hollanders* get intelligence hereof, they are puniſh'd ſeverely.

II. *An*

II. *An Account of Mr* Sam. Brown *his Sixth Book of* Eaſt India *Plants, with their* Names, Vertues, Deſcription, *&c. By* James Petiver, Apothecary, *and* Fellow *of the* Royal Society.

To theſe are added ſome Animals,&c. which the Reverend Father George Joſeph Camel, *very lately ſent him from the* Philippine *Iſles.*

THe following *Plants* being leſs known, and more enquired for by *Curious Perſons*, I took them out of ſeveral *Books* at different *Seaſons*, and placed them here together.

227. *Car-cai* Malab.

Myrobalanus citrina & nigra *Officinarum.*
Myrobalan citrin Pomet l. 7. p. 221. Fig.
Myrobalanifera Sorbi *foliis* Jonſt *Dendrolog.*
Myrobalanus *citrina* Park. 246. 1. *Fig.* citrina *folio* Sorbi *Fragos* 54. c. 22. citrinæ *IB.* l. 2. p. 205. *deſc.* 201. Fig. 2. *id.* pr. 7. lin. 16. *Chabr.* 13. Fig. 3. citrini *Ger.* 1316. Fig. 2. *id.* emac.
Myrobalanus citrina & flava Dale Pharm. 443. 2. flava *Garc.* 116. Fig. 1. Azfar *Arabibus*, Arare *Cambayenſibus* Aritiqui *Medicis.* Clus. *Exot.* 195. Fig. 1. *Ray* H Plant, 1531. 2. *Myrobalani* teretes citrini bilem purgantes *CB.* 445. 2.
Myrobalan *Indien* Pomet. l. 7. 221. Fig. c. 33.
Myrobalani nigræ octangulares *C. B.* 445. 4.
Myrobalanifera Salicis *folio* Jonſt. *Dendr.*
Myrobalanus *Indæ* nigræ, ſine nucleis *I. B.* l. 2. p. 201. Fig. 1. p. 204. deſc. *id.* pr. 7. l. 15. *Chabr.* 13. Fig. 2. Inda & nigra *Offic.* Dale 443. 1. Indica *Park.* 247. 5. Fig. *Indica* aut *nigra* Salicis *folio* Fragos. 54. c. 22. Indica *ſive* nigra *Garc.* 116. Fig. 2. Aſuat *Arabib.* Rezanuale *Cambayenſibus* Cluſ. *Exot.* 195. Fig. 2. *Ray* H. Pl. 1531. 1.
Myrobalanus *Indici* Ger. 1316. Fig. 4.

The *Yellow* and *Black* Myrobalans.

S. B. 227. Pomet. *l.* 7. *p.* 221. *Fig.* *Jonſt.* Dend. *Tab.* Park. 246. 1 *Fig.* Fragos. 54. *c.* 22. I. B. *l.* 2. *p.* 205. & 201. *Fig.* 2. IB. *pr.* 7. *lin.* 16. Chabr. 13. *Fig.* 3. Ger. 1316. *Fig.* 2. Ger. *em.* Dale 443. 2. Garc. 116. *Fig.* 1. Clus. *Exot.* 195. *Fig.* 1. Ray *H. Pl.* 1531. 2. CB. 445. 2. Pomet. *l.* 7. 221. *Fig.* c. 33. CB. 445. 4.

This the *Natives* ſay purges *Choler*, and cures the *Jaundice*, *Jonſt, Dend. Tab.* I B *l.* 2 *p.* 201. *Fg.* 1. *p.* 204.

either in Powder or Decoction; an Infuſion in Cow-piſs, cures *Dropſies* of all ſorts. The *Fruit* well roaſted and eaten with *Jagree* cures *Bloody Fluxes*, and with *Honey* cures *Cough* and *Aſtma.* Theſe ſerve for a hundred things more, mixt with other *Phyſick.*

The *Fruit* when freſh are ſmooth and oval, when half ripe, *Green*, when full ripe ſome are *Yellow*, ſome *Purpliſh*, according as they reſpect the Sun or Shade. Either green or ripe, they have a very harſh taſte. They grow 15 or 16 foot high, and almoſt a foot diameter. *S. B.*

228. Taune-Cai-*Malab.*

S. B. 228. Dale 444. 4. Ger. 1316. *Fig.* Ger. *em.* 1500. *Fig.* Park. 247. *Fig.* 3. Ray *H. Pl.* 1532. 5. C B 445 3. I B. *l.* 2. 201. & 206. I B. *pr.* 7. *l.* 19. Chabr. 13. *Fig.* 6.

Myrobalanus *Bellerica* Officinarum *Dale* Pharm. 444. 4. *Ger.* 1316. Fig. *Ger.* em. 1500. Fig. *Park.* 247. Fig. 3. *Ray* H. Pl. 1532 5. Myrobalani *rotundæ* Bellericæ *C B.* 445. 3. *Bell.* rotundiores *IB.* l. 2. 201. Fig. & 206. *deſc. IB.* pr. 7. l. 19. *Bellericæ Chabr.* 13. Fig. 6. *an* Tani *Malab.* Gottinga *Brach.* Biborala *Luſit.* Heylpeeren *Belg.* Hort. *Malab.* Vol. 4. *Tab.* 10. p. 23? *Ray* H. Pl. 1547. c. 53.

The *Natives* ſay the Decoction with *Jagree* cures the *Gonorrhea.* See its other *Vertues*, in *Mr Sam. Brown* his 3d Book, of the *Phil. Tranſact.* No 271. p. 844. 96.

S. B. 3. 96. *H.* Mal. *v.* 4. *Tab.* 10. *p.* 23. Ray *H. Pl.* 1547. *c* 53.

Of *Myrobalans* the *Natives* ſay the *Woods* hereabout produce 7 ſorts, (beſides the *Bellerica* and *Emblica*; which they do not reckon of this *Species*,) which are, *viz.*

1. Carcai *or* Myrobalanus *Citrina.* S. B. 227.
2. Pala *Carcai*, this I cannot get a good *deſcription* of as yet.
3. Pinge-*Carcai* Myrobalanus *Indica.*
4. Deavatai-*Carcai*, Myrobalanus-*Chebula.*
5. Shuracai-*Carcai.* They ſay is a finger *long*, and 2 or 3 *thick.*
6. Neapaula-*Carcai.* No good *deſcription* of this as yet.

7. Danmantree-*Carcai.* This it's ſaid is as big as the *Cydonia Indica*, and like it both in form and ſmoothneſs. This they ſay will purge as many times as 'tis ſmelt to: In the Proſperity of *St Thomas* they were ſold for 2 *Roupees* apiece; I am told that a *Moor* whoſe Name is *Emann Beg* has one of theſe, and if ſo, I'll procure a ſight of it. If theſe grow hereabout, as I am informed, I'll procure them, nay, if within 200 mile of this place. Three ſorts I have now procured, and ſent their Specimens, *viz.* the *Myrob.* Citrina *and* Bellerica in this 6th Book of odd Plants, and the *Emblica* in the 3d No 106. I ſhall ſhortly have the Mirob. *Indica*, and then I'll ſend it. *S. B.*

Since I made theſe Collections, I went again up the Country, and in my way call'd at *Sange varas Pollum*, where many of the *Citrin Myrobans*, or *Carcai* Trees grow, and ſaw them gather the tender Fruit of the ſaid Trees, which the Wind blew down on the ground; theſe the *Natives* having dryed well in the Sun differed nothing from the *Myrobalanus* Indica; the Natives alſo affirmed they were the *Pinge-Carcai*, ſo that the *black* and *citrin Myrobalan* do both grow on one Tree. Of this after further enquiry will ſend a fuller account.

But I can't forbear adding, that what *Parkinſon* condemns for an Error in *Meſue*, may not be ſo; the laſt aſſerts that the *Chebula*, *Citrina* and *Indica* grow all on the ſame Tree; the 2 laſt I know do, and it may be the firſt do ſo too, in the fertile ſoils of *Arabia* and *Perſia*: (*India*, at leaſt the Sea Coaſts is ſterile in compariſon with them) but here the *Citrin Myrobalans* which grow in rich ground, both Tree and Fruit is larger than the common, and tho the Fruit is not quite ſo large as thoſe that come from the borders of *Perſia*, or inland richer Soyls, yet are very much alike as to form, ſubſtance or taſte. *S. B.*

229. Chandana-Maraum *Malab.*

Santalum *album* & *Citrinum Officinarum*.

Baccifera Madraſpatana *Glycyrhizæ* foliis, fructu coronato *Muſ. Petiver*. 37. Santalum album & pallidum *C B*. 392. 1, 2. album & citrinum *Park*. 1605. c. 47. *IB*. l. 4. 486. Fig. *Chabr*. 36. Fig. 5, 6. *Dale* 478. 1, 2. *Pomet* l. 3. 107. c. 3. *Ger*. 1388. *Ray* H. Pl. 1804. Santalum verum ligno citrino & albo, foliis Laurinis *Breyn*. prodr. 2. 88. 1. WHITE and YELLOW SANDERS.

S. B. 229.
Muſ. Petiver 37.
C B. 392. 1. 2.
Park. 160.5. *c.* 47.
IB. *l.* 1: 4 486.
Fig. Chabr. 36. *Fig.* 5. 6.
Dale 478. 1. 2. Pomet. *l.* 3. 107. *c.* 3.
Ger. 1388. em.
Ray *H. Pl.* 1804. Breyn. *pr.* 2. *p* 88. 1.
N. B.

Grows 40 or 50 foot *high*, and a foot or more *diameter*. The *Sanders* is only the heart of the Tree, the Sap is very large, almoſt equal to that of *Ebony*. The Natives uſe the *Decoction* as a Specifick in *Conſumptions* and Hectick *Feavers*, outwardly they anoint with it, ground in *Roſe-water*, to allay heat, and for the ſmells ſake.

The *White Sandal* or *Sanders* is only the *yellow* fell'd too ſoon, before 'tis ripe, which is Cordial and Cooling.

The *Natives* reckon 3 ſorts of *Sandal* or *Sanders*, viz. 1ſt, This. 2dly, *Red Sanders*. S. B. 6. 230. 3dly, *Black Sanders*, S. B. 2. 71.

S. *B.* 6. 230.
S. *B.* 2. 71.

230. Chum-maraum *Malab.*

Santalum *rubrum* quibuſdam, *Arbor* Orientalis *Pomæ* facie *Muſ. Petiver*. 679. INDIAN RED SANDERS.

S. B. 230.
Muſ. Petiv. 679.

This grows 16 or 18 foot *high* and one *thick*: Here is neither *Fruit* nor *Flower*, but I will get them by the next opportunity: The *Decoction* of the *Wood* expels *Wind*, eaſes *Gripes* and is ſomething cooling, corrects *Choler* and purifies the *Blood*: 'Tis where it grows in the *Woods* counted a general *Panacea*. S. B.

S. B. 231. 231. Mungle *Malab.* Veadaru *Gent.* BAMBU.

Bambu Indica *Sparganii* capitulis, verticillis diſpoſitis.

This grows 40, and ſometimes 50 foot *high*, and 6 inches *diameter*, the *Seed* is like *Seſamum* (or *Gingelle*, as the *Malabars* call it) which I will ſend another time. A *Decoction* of the *Leaves* and *Rind* diſſolves clotted *Blood*, provokes the *Lochia*, and is mixt with other *Phyſick*, for many things: The *Salt* or white ſubſtance found within the *Bambu*, breaks the *Stone*, and provokes *Urine*. S. B.

S. B. 232. 232. Coche Tammartai *Malab.*

Bilimbi Malabarica *Pajomiriobæ* folio.

Ray *H. Pl.* Malus *Indica*, fructu pentagono, *Bilimbi* dicta *Ray* H. Pl. 1449.
1449. 7. 7. Bilimbi *Malab.* Malaki Karamboli *Bram.* Bilimbinos *Luſit.*
H. Mal *V.* 3. Blymbinen *Belg.* H. Mal. *Vol.* 3. Tab. 45. 6. p. 55. Billing-bing
*Tab.*45.6.*p.*55. *Malaiis* Bont. 133. Fig. *an* Belimbi *arbor* Zan. 17 & 25? Flor.
Bont. 133 *Fig.* *Malab.* 167. 5. *id.* Fol. 42. 2. 5.
Zan. 17 & 25.
Fl. Mal. 167, 5. This is a *ſpecies* of S. B. 5. 207. grows 15 or 16 foot *high*,
id. *Fol.* 42. 2. 5. and *thick* as ones thigh: the *Fruit* is cooling and very ſowr, ſerves for *Atchar*, ſweet meat, and is put in *Carries*. S. B.

This differs from S. B. 5. 207. in having much larger *Flowers*, and its *Leaves* longer and narrower, with 10 or more pair on each ſtalk, whereas the other has rarely more than five.

S. B. 233. 233. Paringe Nellekai *Malab.*

C. B. 401. 2. *Charamei* Malabar. *Caſſiæ fiſtulæ* folio.

Pluk *Tab.* 269. Arbor exotica, fructu racemoſo, *Charamais* dicta *C. B.* 401. 2.
Fig. 2. *Alm.* Arbor *Malabarica* Fraxini fere folio, oſſiculo fructus octangulari
Bot. 45. *pl.* 11. *Pluk.* Tab. 269. Fig. 2. *Alm. Bot.* 45. pl. 11. lin. 25. Charamei *Park.*
Park. 1638. 1638. c. 108. Fig. *Acoſt.* Lugd. 1875. c. 115. Fig. *Acoſt.* fol. Pyri
c. 108. *Fig.* *IB.* l. 1. p. 88. c. 20. Fig. *IB.* pr. 3. c. 20. *Chabr.* 4. Fig. 3. Charameis
Lugd. 1875. *Caſt.* Durant. 120. Fig. *Acoſtæclus Exot.* 292. c. 58. in *Canara, Decan*,
c. 115. *Fig.* Araznavali *vulgo* Charameis; *Arabibus Perſis* & *Turcis* Ambela.
J. B. *l.* 1. *p.* 88.
c. 20. *Fig.*
I B. pr. 3. *c.* 20. Neli pouli ſeu Bilimbi altera minor Amvallis *Bram.* Cherame-
Chabr. 4 *Fig.* 3. la *Luſit.* Suercnoop *Belg.* H. *Mal.* Vol. 3. Tab. 47. 8. p. 57. *Ray*
Durant. 120. H. Pl. 1450. 8. Fl. *Mal.* 61. 2. *id.* Fol. 16. 1. 3.
Fig. Clus *Exot.*
292. *c.* 58. This grows about 12 foot *high*, and almoſt as *thick* as ones
H. Mal. v 3. *Tab.* thigh: here are 2 *ſorts*, one bears Fruit, the other not, (which
47. 8. *p.* 57. the

the *Hort. Malab.* alſo confirms) I take this for a ſort of *Myrobalan*, and is the moſt pleaſant of all I know as yet, having a very grateful acidity, and makes ſweet Meats, *Achar*, *&c.* The *Portugueze* here call this *Cheremelas*, the *Natives* uſe it very little in *Phyſick*; the name ſignifies *Chriſtians* Myrobalan, *or* Chriſtians *Nellecai*. S. B.

Ray H Pl 1490. 8. *Fl. Mal.* 61. 2. *id. fol.* 16. 1. 36

234. *Tumba* maraum or *Carpa* maraum *Malab.*

Guajavæ fructu, arbor *Madraſp.* foliis *Fagi* maximis *Muſ. Petiver.* 417. INDIAN EBONY.

S. B. 234. *Muſ. Petiver* 417.

This is the *Ebony* we uſe here; 'tis a very large tall Tree, about the Mountains of *Trippetee*, 50 or 60 foot *high*, and about 3 foot *thick*; but thoſe that grow nearer the Sea ſide are hardly one third of that bigneſs; containing little or no *Ebony*: the *heart* of the Tree only being *black*, which in the largeſt Trees ſeldom exceeds a foot, often leſs, the reſt all white Sap: The *Fruit* is good to eat, being very ſweet, like *Chetapaulum* and *Atapaulum*, S. B. 5. 193. the Seed of which laſt and theſe are exactly alike: I therefore count them to be of kin. I can't as yet learn that the *Natives* uſe this in *Phyſick*, except here and there one, who uſe it as an ingredient in their *Cuddanee* (which is Decoctions for the *Pox*) which poſſibly they may have done in imitation of the *Portugueſe*, who do the ſame. S. B.

235. Poon chedde Malab.

Waga ſenſitiva aquatica *Malabarica* non ramoſa.

an Mimoſa *Orientalis* non ſpinoſa, rarioribus ramis, floribus ſpicatis *Pluk.* Tab. 307. Fig. 4. *an* Æſchynomene *mitis* 2, vel potius Herba caſta *Zeylanica* ſiliquis latis compreſſis minoribus *Breyn.* Cent. 47. Fig. *Siliq.* 52. 2. 3. Ladſchini *Bram.* Totta Vaddi *Malais.* *Ray* H. Pl. 981. 7. Niti Todda Vaddi *Malab.* Lauri *Bram.* H. Mal. *Vol.* 9. Tab. 20. p. 35.

S. B. 235. Pluk. *Tab.* 307. *Fig.* 4. Breyn. *Cent.* 47. *Fig.* 52. 2. 3. Ray *H. Pl.* 981. 7. *H. Mal* v. 9. *Tab.* 20. p. 35.

This is a *Species* of *Herba viva*, for if toucht it ſhuts its *Leaves* (tho very ſoftly) which before were expanded, the branches do not move. It grows in *Ponds* from a light, ſpongy, long trailing *ſtalk*, which ſpreads much, is about a finger *thick* when wet, but when dry ſhrinks to a ſmall matter, as may be ſeen by the white part of the ſtalk of this Plant, which ſerves for a *Root*: The *Natives* neither eat, nor uſe this in *Phyſick*, but they believe if the *Juice* of it be rubb'd on *Womens Breaſts*, which are too big, it will make them little, and alſo will dry away *Milk*. S. B.

236. Chaddai

S. B. 236.
H Mal. v 9.
Tab. 21. p. 37.

236. Chaddai lackaree *Malab.*

Waga ſenſitiva, *Madraſpatana*, ramoſa, virgulis lignoſis. *an* Malam Todda vaddi *Malab.* H. Mal. *Fol.* 9. Tab. 21. p. 37? which the *deſcription* better anſwers than the *Figure.*

This is another *Species* of *Herba Viva*, and grows on dry ground, the *Flower* is of a purpliſh colour when freſh: If you touch this Plant never ſo gently it will all fall down, and the *Leaves* ſhut together much more than the former. This is commonly eaten by the Natives as Food; it's of no uſe in *Phyſick*, but theſe People ſay that if the *Juice* of it be rubb'd on the Hands of any perſon, and he ſtroaks the Breaſts of a Woman, 'twill cauſe her to love him; they are full of theſe ridiculous ſtories. S. B.

H.M.v 9.p.37.

The *Hort. Malab.* alſo aſſerts Vol. 9. p. 37. that the Natives ſuperſtitiouſly believe it will provoke Love, and reſtore loſt Virginity. To this let me add another ſpecies, *viz.*

S. B. 236. 1.

Waga ſenſitiva *Madraſpatana* non, vel minus ramoſa. It *differs* from the *laſt* in being leſs branched, and its ſtalks long, very ſlender and not woody, the divarications of its Leaves are rarely 3 pair, and often but one; its *Flower* or *podds* differ not.

S. B: 237.
Alm. Bot. 5 *pl.* 7. Breyn. *pr.* 1. *p.* 35. *pl.* 5.
Breyn *pr.* 2. *p.* 37. *pl.* 1.
P. B. pr. 331. 1.
Breyn. *Cent.* 61. *c.* 22. *Fig. opt*
Breyn. *pr.* 1. *p.* 35. *pl*, 5.
Ray *H. Pl.* 981. 10. *El. Bot.* 492 *Inſt. R.* Herb. 619.
Du Tertre 154.
Cat. Pl. Jam, 149. *pl.* 2.

237. Mail Conei *Malab.*

Pavoninus utriuſque *Indiæ*, flore variegato.

Acacia *Orientalis* glorioſa, *Coluteæ* foliis, rachi medio ad genicula ſolummodo ſpinis gemellis aculeata *Alm. Bot.* 5. pl. 7.

Colutea *Indica*, platycarpos flore pavonino ſive Flos *Indicus* pavoninus *Monaramal* Zingalenſibus *Herman.* not. Mſſ. *Breyn.* pr. 2. p. 35. pl. 5.

Criſta pavonis *Coronillæ* folio 1. ſive floribus ſpicatis ampliſſimis ex aureo & coccineo variegatis, ſiliqua Piſi *Breyn.* Prod. 2. pl. 37. pl. 1.

Erythroxylum *Indicum* minus, ſpinoſum, *Coluteæ* foliis, ſiliquis anguſtioribus, flore ex luteo & rubro eleganter variegato *P. B.* pr. 333. 1.

Frutex Pavoninus *ſive* Criſta Pavonis *Breyn.* Cent. 61. cap. 22. *Fig.* opt. *Breyn.* prodr. 1. p, 35. pl. 5. *Ray* H. Pl. 981. 10.

Poinciana fl. pulcherrimo *El. Bot.* 492. *Inſt.* R. Herb. 619.

Poincyllade ou *Fleur* de *S. Martyn* Duterſre 154.

Sena ſpuria arborea ſpinoſa, foliis alatis ramoſis ſeu decompoſitis, flore ex luteo & rubro ſpecioſo *Cat. Pl.* Jam. 149. pl. 2.

Monarakudimbija *ſive* Cauda Pavonis *Zeylanenſibus*, Foula de Pavan *Luſit* Tſetti Mandaru *Malab.* Tsjettia *Bram.* Paauwen ſtaarten *Belg*. Hort. *Malab*. V. 6. Tab. 1. p. 1. *Flor*. Malab. 91. 11. *id*. Fol. 23. 2. 11. *St Jago*-Flower of Ligon p. 15 & 99. *Flower* Fence of *Barbadoes*. *Wild* Sena *or* Spaniſh *Carnations* of *Jamaica*. Cat. Pl. *Jam*. 149. 2.

Mr Brown ſays theſe *Flowers* are conſecrated to their Idols, and the *Hort*. *Malab*. affirms that they are generally cultivated in their Gardens and Burying-places, it being there an ever-green, and very beautiful, bearing Flowers or Pods moſt part of the year, eſpecially in *May* and *Auguſt*, and about our *Chriſtmas*.

238. Shevanar calunga *Malab*.

Lilium *Zeylanicum* ſuperbum *Hort*. *Amſt*. V. 1. p. 69. Fig. 35. Lil. *Zeyl*. ſuperbum *vulgo* H. L. Bat. 689. Fig. L. *Zeyl*. ſuperb. rad. tuberoſa, florum petalis coccineis fimbriatim reflexis *H. Boſian*. Methonica *Malab*. Niengala *Zeyl*. Muſ. *Zeyl*. Mendoni *Mal*. Arty *Bram*. Raiz d' empoſe *Luſit*. Croes-ſteen *Belg*. Hort. *Malab*. V. 7. Tab. 57. p. 101. Fl. *Mal*. 175. 4. *id*. Fol. 44. 2. 4. *Ray* H. Pl. 1915. The proud *Zeylon* Lilly.

S B 238. *Hort*. Amſt. *v*. 1. *p*. 69, *Fig*. 35. *H. L*. Bat. 689 *Fig*. *H*. Boſian. *H*. Mal. *v*. 7. *Tab*. 57. *p*. 101. *Fl*. Mal. 175. 4. id. *fol*. 44. 2. 4. Ray *H*. *Pl*. 1915.

When this grows near any thing that may ſupport it, it riſes 6 or 8 foot *high*: but by it ſelf not above 3 or 4. the *Leaves* below and at top alike; the *Root* is crooked, a finger *thick*, and about 4 inches *long*, white like *Ginger*, and uſed by the *Natives* as a general Counter Poyſon, which it expels by Vomit, *Doſe* ℈i. in a Cup of *Vinegar*, rub it on a Stone till it diſſolves and mixes with the ſame: the *Natives* make an Oyl with this, *Shevana weamboo* and *Odingee*, of the *Root*, *Bark*, *Leaves*, *Fruit*, *Flowers*, &c. of theſe 3, which they cut ſmall, and put into a very great Earthen Pot, covered with a flat Earthen pan, and lute it on; in the bottom of the great Pot they make a hole big as a Sail Needle, to which they apply a ſmall Pan to receive the *Oyl*, the great Pan being buried half way in the ground, they make a Fire round it with *Cow Dung*, till all the Oyl is diſtilled into the Pan below. This Cures, they ſay, all ſorts of venemous bites and *Vanda guddee*: but againſt that of the *Cobra de Capello* 'twill do no good, as I have tryed. *S. B.*

The *Hort*. *Malab*. takes notice that the *Natives* aſcribe very great *Sympathetical*, *Magical* and other *Metaphyſical Operations*, to that part of this *Root* which grows towards the *North*. Hort. *Malab*. V. 8. p. 108.

H. Mal. *v*. 7. *Tab*. 57. *p*. 107.

239. Peape pingkai *Malab*.

Luffa *Malabarica* fructu reticulato ſem. nigro.

Cucumis *Indicus* ſtriatus operculo donatus, corticoſo putamine tectus

S. B. 239. Pluk, *Tab*. 172. *Fig*. 1.

Alm. *Bot.* 123. tectus *Pluk.* Tab. 172. Fig. 1. *Alm. Bot.* 123. pl. 12. *Cucumis* ſyl-
pl. 12. veſtris *Malabaricus* fructu ſtriato amaro *Comel.* in H. Mal. V. 8.
H. Mal. *v.* 8.
Tab. 7. *p.* 13. p. 14.

H. Lugd. *Bat.* Pepo *Zeylanicus* reticulatus & ſulcatus, ſemine nigro. *Parad.*
482. *pl.* 4. *Bat.* app. 11. pl. 2. *an* Pepo *Indicus* reticulatus ſeminibus nigris
minor *H. L. Bat.* 482. pl. 4?

Picinna *Malab.* Gonſaly *Bram.* Patolas *Luſit.* Traken Belg. *H.*
Malab. V. 8. Tab. 7. p. 13. *Fl. Malab.* 97. 2. *id.* Fol. 25. 1. 2.

H. Mal. *v.* 8. The *Root* is 2 fingers *thick*, a yard *long*, ſometimes more, white
Tab. 7. *p.* 13. both within and without, the *Root* and *Fruit* are very bitter and
Cathartick; the *Juice* of the *Fruit* I have ſeen put up the Noſe
of an *Apoplectick Perſon*, which cauſed him to void much Slime
and Filth by *Mouth* and *Noſe*, and in 2 days recovered him, contrary to expectation. *S. B.*

This *Plant* is admirably delineated amongſt *Dr Hermans Deſigns*, mentioned in the end of his *Paradyſus Batavus*, Printed *A. D.* 1698. in 4to; where the *Flower*, *Seed* and a view of the reticulated pulp is there elegantly ſhewn, which neither the *Hort. Malab.* or *Dr Plukenet's Figures* hath expreſt.

My worthy Friend Mr *Edward Bulkley* ſome time ſince procured me a decorticated Fruit of this *Gourd* from *Perſia*, compoſed of curious reticulated Figures, as you may ſee it *Figured* in the xith *Table* of my *Gazophylacium* Naturæ.

S. B. 240. 240. Narre villan calunga. *Malab.*

Liliaſphodelus *Malabaricus* anguſtifolius.

H. Mal. *v. xi.* Belutta Pola Taly *Malab.* H. Malab. V. xi. *Tab.* 38. p. 75.
Tab. 38. *p.* 75. This has a *bulbous Root* big as a very large *Turnip*, the inſide
Alm. *Bot.* 219. of the *Flower* is White, the outſide Red, has no ſmell: The *Juice*
pl. *xi.* of the *Root*, or a *Decoction* of it, helps ſharpneſs of *Urine* and
Gonorrhea. S. B.

Altho *Dr Plukenet* in his *Almageſt. Botan.* p. 219. pl. xi. hath quoted the *Hortus Malab.* for this Plant, yet ſince that in his *Mantiſſa* he hath made and altogether new.

To this let me add another which Mr *Brown* ſent me, gathered at *Arcaut* about *Fort St George*, viz.

S. B. 240 1. Liliaſphodelus *Malabaricus* latifolius.

H. Lugd. *Bat.* Lilium *Zeylanicum* umbelliferum & bulbiferum. *Tolabo* Zeyla-
683 *Fig.*
H. Mal. *v. xi.* nenſibus *Muſ. Zeyl.* H. L. Bat. 683. Fig. Sjovanna Pola Tali *Ma-*
Tab. 39 *p.* 77. *lab.* Gola Kondo *Bram.* H. Mal. V. xi. Tab. 39. p. 77.

This *Bulb* is larger, and hath much broader Leaves than the laſt.

241. Coode tourae *Malab.*

Phaſeolus *Emuyacus* foliis *Cajan* minoribus, ſiliquis *Orobi* ferrugineis.

an Phaſeolus minor *Biſnagaricus*, foliis argenteo colore villoſis, ſiliquis toroſis brevibus ſpadicea hirſutie pubeſcentibus, fructu parvo Scaraboide nigro *Pluk.* Tab. 52. Fig. 3. *Alm. Bot.* 290. pl. ult. an *Phaſeolus* Zeylanicus *Salviæ* foliis ſubrotundis mollibus & hirſutis *P. B.* pr. 364. pl. 5. an *Orobus* Phaſeolodes *Zeylanicus* folijs Salviæ rotundis incanis ſubhirſutis *P B.* pr. 359. pl. ult.

A Decoction of the *Root* (which is a Finger thick and white) cures *Fevers.* S. B.

Pluk. *Tab.* 52. *Fig.* 3. *Alm.* Bot. 290. pl. *ult.* P. B. *pr.* 364. *pl.* 5. P. B. *pr.* 359. pl. *ult.*

That Curious Botaniſt *Mr James Cuninghame* firſt brought me this from *Emuy.*

242. Cantau verre *or* Caleau verre *Malab.* Anil *Madraſpatana* trifoliata, ſiliquis carinatis hirtis. *H. Un.* 35. Act. *Phil.* No 244. p. 330. pl. 35.

The Decoction of the whole Plant cures *Rheumatiſms* and *Pains.* This is *wild Nil*, but makes no *Indigo.* S. B.

S. B. 242. H. Un. 35. *Act* Phil. *No* 244. *p.* 330. *pl.* 35.

243. Tipplelee *Malab.*

Piper *longum* Officinarum.

Piper *longum I. B.* l. 15. p. 186. Fig. I. B. pr. 39. pl. 22. *Chabr.* 125. Fig. 6. *Ger.* 1355. Fig. *Ger.* emac. 1538. *Fig.* Park. 1604. Fig. *Cluſ.* Exot. 20. *Fig.* & 183. Fig. *Fragos.* 32. *Garc.* 94. an *Piper* longum *Hern.* 126. Fig? Tlatlancuaye & Ecapatli *Mexic.* Buyobuyo & Sabiam *Phillipenſibus.*

Piper longum *Orientale* CB. 412. 3. *an* Piper longum Javanenſe Incolis *Chiabe* dictum *Linſchot.* Ind. Or. p. 4. Fig. 20.

Pepe lungo *Durant.* 343. Fig.

Cattu Tirpali *Malab.* Bipali *Bram.* Pimenta *Luſit.* Lange Peper *Belg.* H. Mal. Vol. 7. Tab. 14. p. 27. *Fl. Mal.* 215. 2. *id. Fol.* 54. 2. 1.

Darfulful *Arab.* Pimpilim *Bengal.* Piſ. *Mant.* Arom. 185. Fig.

Poivre long des Indes *Pomet.* l. 7. p. 191. Fig. c. 6. p. 196. an *Poivre* long de l' *Amerique* Pomet. l. 7. 191. Fig. c. 7. p. 196?

Dale 405. 1. *Ray* H. Pl. 1343. 5.

S. B. 6. 243. I B. *l.* 15. *p.* 186. *Fig.* I B. *pr.* 39. *pl.* 22. Chab. 125. *Fig.* 6. Ger. 1355. *Fig.* Ger. *em.* 1538. *Fig.* Park. 1604. *Fig.* Clus. *Exot.* 20. *Fig* & 183. *Fig.* Fragos. 32. Garc. 94. CB. 412. 3. Durant. 343. *Fig.*

This is the *true* or Beſt *Long Pepper*: Here is in the *Bazar* another ſort, bigger, but not ſo good, call'd by the *Malabars* Auna *Tipplelee.* The *Natives* uſe the ſmall ſort in many Diſtempers, as *Fevers*, want of *Appetite*, for *Lying in* Women, *&c.* but the other they do nothing with but give it as *Phyſick* to their *Elephants.* S. B.

After *Dr Plukenet* has made 2 different *Long Peppers* of this one, *viz.* in his *Phytographia*, Tab. 104. Fig. 4. and in his *Mantiſſa*, p. 151. yet in the next line he ſays this *Tipplelee* of the *Malabars* is the *Piper nigrum præſtantiſſimum*; which contradiction I know not how to reconcile.

S. B. 6. 244.

244. Aumana maraum *Malab.*

Palma Madraſpatana, *Oleandri* anguſtiſſimi folio.

H. Mal. v. 1. Tab. 1. p. 1. Ray H. Pl. 1356. 4.

This is a large and ſtrange ſpecies, as I believe, of the *Palm-tree*, the Body in all things reſembles the *Coco-nut Tree* (Hort. *Malab.* Vol. 1. Tab. 1. p. 1. *Ray* H. Pl. 1356. 4.) but the *Fruit*, *Flower* and *Leaf* are different. I can learn no *Phyſical Uſe* it has as yet. *S. B.*

S. B. 6. 245. Pluk. *Tab.* 120. *Fig.* 1.

245. Varail chuddee *Malab.*

Chamæ-criſta Pavonis *Madraſpatana* minima, *Nabatheæ* foliis.

This is another ſpecies of *Herba viva*, the Branches budge not, only the Leaves ſhut when toucht. The *Natives* grind it with *Breaſt Milk*, and anoint Infants who have the *Carpaum* or *Scab* with it. *S. B.*

Notwithſtanding *Dr Plukenet* in his *Phytograph.* Tab. 120. Fig. 1. had given a good Cut of this from a Specimen I gave him, yet in his *Mantiſſa*, p. 131. he has been pleaſed to give it again as altogether New, with a Title very different from it.

246. Conea maraum *Malab.* CASSIA FISTULA.

S. B. 6. 246. Bont. 101. *Fig. cap.* 10. Pomet. *l.* 7. 217. *Fig. c.* 30. 219. Veſl. 3. *c.* 2. Cam. *H. Med.* 36. *pl.* 3. Ger. 1242. *fig. opt.* Ger. *em.* 1431. *fig.* Fragoſ. 43. *c.* 14. Durant. 97. *fig.* Alp. *Ægypt.* Pat. 3. *c.* 2. Hern. 87. *c.* 55 C B. 403. 1. Zan. 25. Nieremb. 327. *c.* 88. Breyn. *pr* 2. *p.* 26. *pl.* 5. Lob.

246. Caſſia *Fiſtula* Officinarum.

Arbor *Caſſiam ſolutivam* ferens *Bont.* 101. Fig. c. 10.

Caſſe des Iſles *Pomet.* l. 7. 217. Fig. c. 30. 219.

Caſſia *Veſling.* in Alp. p. 3. c. 2.

Caſſia *Ægyptia* ſive *purgans* Cam. H. Med. 36. pl. 3.

Caſſia Fiſtula *Ger.* 1242. Fig. opt. *Ger.* emac. 1431. *Fig.* Fragoſ. 43. c. 14. *Durant.* 97. Fig. *Alp.* Ægypt. *Ven.* p. 1. c. 2. *id.* Pat. 3. c. 2. *Hern.* 87. c. 55.

Caſſia *fiſtula* Alexandrina C. B. 403. 1.

Caſſia *fiſtula* les *Antiles* Rochfort. *Hiſt.* 77.

Caſſia *fiſtula* Indica *Zanon.* 25.

Caſſia *fiſtula* Occidentalis *Nieremberg.* Hiſt. *Nat.* 327. c. 88.

Caſſia fiſtula *ſeu* Nigra *Alexandrina* Geſn. H. *Germ.* 251.

Caſſia *fiſtula* vulgaris, fl. luteo *Breyn.* pr. 2. p. 26. pl. 5.

Caſſia *fiſtula* & *Caſſia* ſiliquoſa purgatrix *Lob.* in *Pharm.* Rond. 40.

Caſſia *nigra* Dod. *Pemp.* 787. c. 30. Fig.

Caſſia *purgatrix* IB. l. 12. p. 416. c. 2. Fig. *Chabr.* 89. Fig. 3.

Caſſia ſolutiva *IB.* pr. 32. pl. 4. *Cluſ.* Exot. 271. c. 22. & 332. c. 44. *Garc.* 122. c. 29.

Caſſia *ſolutiva* vulgaris *Park.* 234. c. 33. Fig. 1.

Siliqua aut *Caſſia* purgatrix, Arabum *Carrobiis* ſimilis *Adv.* 414.

Siliqua *Indica*, i. e. Caſſia *fiſtula* quam veteres *Fabam Indicam* vocant *Cord.* 194. c. 24.

Chaiarx ambar *Ægypt.* Conna *Malab.* Bajo *Bram.* Hort. *Malab.* V. 1. Tab. 22. p. 37. Quauhayovatli *Mexican.* Hern. 87. c. 55. *Dale* 505. 5. *Ray* H. Pl. 1746. c. 8. *Cat.* Pl. *Jam.* 145. pl. 1.

This *Caſſia Fiſtula* is a very great Tree, the *Natives* reckon 4 ſorts of it, *viz.* 1. This. 2. *Chengunne*, or *Chen* conea. 3. *Mail Conea.* 4. *Mange* Conea. But this only bears the *purging Caſſia fiſtula*; the *Bark* of the *Root* is likewiſe purging: The *Natives* Cure *Anaſarca's* by applying boyl'd *Leaves* all over the Belly. *S. B.*

in Pharm. *Rond.* 40. Dod. *Pempt.* 787. *c.* 30. *fig.* IB. *pr.* 32. *pl.* 4. Clus. *Exot.* 271. *c.* 22. & 332. *c.* 44. Garc. 122. *c.* 29. Park 234. *c.* 33. *fig.* 1. *Adv.* 414. Cord. 194. *c.* 24. Hern. 87. *c.* 55. *H.* Mal. *v.* 1. *Tab.* 22. *p.* 37. Dale 505. 5. Ray *H. Pl.* 1746. *c.* 8. Cat. *Pl.* Jam. 145. *pl.* 1.

247. Malleaarreſh *Malab.*

Is a great Tree, grows on *Tripitte Mountains*, the *Natives* bath in a *Decoction* of the *Wood*, *Bark* and *Leaves*, for *Rheumatick* pains. *S. B.*

S. B. 6. 147.

The *Fruit* and *Leaf* ſeem to belong to different *Plants*, the *firſt* very much reſembles the *Samſtravadi* S. B. 4. 147. and the *Leaf* is like that of a *Melon.*

S. B. 4. 147.

Here follows ſome ANIMALS, &c. *Obſerved in the* Philippine Iſles, *by that* Reverend *and* Learned *Father* GEORGE JOSEPH CAMEL, *from whom I lately received them.*

1. CAto-Simius volans Cameli. GAZOPHYL. *noſt.* NATURÆ Tab. 9. Fig. 8.

Colago & Cagvang *Byſaiani.* Gigua *Pampangi* & *Tagali.*

S. B. 6. 1. *GAZ. NAT. Tab.* 9. *Fig.* 8.

This ſtrange and wonderful *Creature* is about the bigneſs of a *Cat*, its body like an *Ape*, but ſlenderer; from *Head* to *Tail* are 3 ſpans, between the *Arms* extended 2, and the Thighs 1 and a half. It's 3 ſpans from the fore to the hinder Toes, and as many between the 2 fore Legs, but between the hinder ones it's but 2 ſpans. Its *Belly* an hand breadth, and the Skin from it a ſpan. They report, that in the *Province Pampanga* they are as large as a *Chineſe Umbrella*, or 6 ſpans broad.

His *Hair* is browniſh, on the back of a *Mouſe-dun*, mixt with very curious white, ſtrip'd doun, like thoſe Skins which the *Germans* call *Feck* (which perhaps is our *Fitchow* or *Pole-cat*) theſe are longer on the Body, and ſhorter on its membranous skin. This *Skin* is extended round its Body from Head to Tail like a *Bat*, with which being expanded, they fly ſlowly from the top of one Tree to the middle of the next, and then advance up it by flying leaps.

It hath a *Monkeys Face*, flat round bald *Ears*, each Foot hath 5 crooked flat Lyon-like very ſharp *Claws*: on the *Belly* of the *Females* are 2 little Bags, to which the young ones cling and ſuck: We know not what is their *Food*, but it's probably *Fruit*, becauſe their uſual abode is on Trees.

See its *Figure*, as *Father Camel* ſent it me, in the 9th *Table* of my *Gazophylacium* Naturæ.

S. B. 6. 2. 2. Papilio *Philippenſis* Maximus, lituris nigris mixtus.

This is ſomewhat bigger than No 6. following, but the Body much the ſame, its higher and lower Wings on both ſides have a *yellowiſh* caſt next the Body, the reſt *white*, almoſt equally mixt with various *black* ſpots, *Iſlets*, ſtreaks, *&c.*

S. B. 6. 3. 3. Papilio *Philippenſis* permaximus nigreſcens, campis aureis inferioribus alis pernotatis.

The *upper wings* extended are more than 6 inches between the Tips, theſe are *blackiſh* next the Body, the reſt feathered with grey: In the middle of each *lower Wing* are 7 or 8 *golden* ſhining *fields* incloſed with black Veins; theſe are incompaſſed with a large black Selvedge ½ inch broad: Its *Body* black, *Belly* yellow, and *Rump* ſilvery.

S. B. 6. 4. 4. Papilio *Philippenſis* major nigreſcens, campis aureis inferioribus alis pernotatis.

This is much *leſs* than the laſt, otherwiſe very like.

S. B. 6. 5. 5. *Papilio* Luzonicus *Calendulaceus* pallidus.

Muſ. Petiv. 518. This differs from our *Papilio* Javanicus *Calendulaceus* Muſei *Petiver*. 518. in having the upper Wings on both ſides *whitiſh*, where that is *yellow*; but the *lower Wings* are the ſame, and particularly the Scarlet ſpot under each Shoulder; theſe are ſomewhat more than 3 inches between tbe Tips.

S. B. 6. 6. 6. Papilio *Luzonicus* maximus nigreſcens, maculis coccineis ſubtus perbelle notatus. GAZOPHYL. *noſt.* NATURÆ Tab. xi. Fig. 8.

The Body of this elegant and large *Butterfly* is black, as are its upper Wings on both ſides, except a long Scarlet ſpot on its Shoulders beneath, with another on its lower Wings; on the edges of theſe it's curiouſly beſet with ſeveral others very beautiful to behold, imitating the fineſt *Chermeſine*.

7. Papilio *Madraſpatanus* nigreſcens, maculis ſanguineis pal- S. B. 6. 7.
lidiſque interſperſis *S. B.* 3. 27. Act. *Phil.* No 271. p. 862. 27. S. B. 3. 27.

8. Papilio *Philippenſis* nigreſcens non caudatus, maculis albis S. B. 6. 8.
ſemicirculari.

This only differs from S. B. 3. 30. *Act. Phil.* No 271. p. 862. 30. in being without a Tail.

9. Papilio *Philippenſis* major, obſcure fuſcus, albis ſtriis inſu- S. B. 6. 9.
liſque mixtis.

This and the next may be *Male* and *Female*.

10. Papilio *Orientalis* e fuſco & albeſcente, ſtriis maculiſque S. B. 6. 10.
mixtus *S. B.* 3. 32. Act. *Phil.* No 271. p. 682. 32.

From the laſt this differs, in having its *Spots* and *Iſlets* white, it is alſo void of a particular black ſpot on a Vein near the middle of each lower Wing, which is very obvious in the other.

11. Papilio *Philippenſis* major, pallide cæruleſcens, margine S. B. 6. 11.
veniſque nigricantibus.

This reſembles the 2 laſt in the diviſions of its colours and magnitude, but this has few or no ſpots on the edges, and is of a *bleak blue*, where the other is *white*.

12. Papilio *Orientalis* fuſcus, umbra cæruleſcente albo baſi cir- S. B. 6. 12.
cumſcripta *Muſ. Petiver.* 720. The *Indian* Blue *Glow*. Muſ. Pet. 720.

This is moſtly dark brown or blackiſh above, except in the middle of each Wing, where is a large white field, which by reflection is encompaſſed with a glorious ſhining blue caſt, which gains or loſes according to the poſition of the light. Underneath it ſhines not, nor is its ground ſo dark as above, but adorn'd with *White Feilds*, *Specks*, *Wars*, *Moons*, *&c.*

13. Papilio *Philippenſis*, oculatus ferrugineus. S. B. 6. 13.

This is a midling *Butterfly*, of a brown ruſty colour, has 6 Eyes on each lower Wing, and laced on the edges.

14. Papilio *Philippenſis* minor albus, macula & apicibus ni- S. B. 6. 14.
gris.

This is like one I have obſerved here in *England*, but leſs.

15. Papilio *Philippenſis* minor luteus, marginibus ſuperne ni- S. B. 6. 15.
gricanibus.

I have 3 or 4 varieties like this from *Africa* and *America*; but this differs from them all, in having its dark Selvedge all round the Fly, which in its upper Wing is jagged.

S. B. 6. 16. **16.** Papiliunculus *Philippenſis* e fuſco cinereus, ſubtus pulchre notatus, humeris aureis.

This ſmall pretty *Inſect* is ½ an inch *broad*, and near 1 ½ *long*, above of a dark hair colour, with pale in the middle, its ground underneath is half brown and pale, the Shoulders are elegantly ſtriped with greeniſh ſhining Gold, and in its lower Wings are 7 oval *black* ſpots, ſet in a *white* Feild.

S. B. 6. 17. 17. Papiliunculus *Philippenſis* e fuſco cinereus, oculis tergeminis, alis inferioribus.

This is ſomewhat leſs than the laſt, *brown* above and *cinereous* underneath, near the angle of each upper Wing is one large *black eye* in a *pale* circle, and in the lower 3 pair, of different magnitudes, the largeſt in the middle.

S. B. 6. 18. 18. Papiliunculus *Philippenſis* cæruleus major, ſubtus marmoreatus.

This chiefly differs from the next in being larger (*viz.* 1 ¼ inch long) and the ſpots on the lower Wings more obvious, particularly one at each Tail (which terminates in a Hair) as alſo 2 black ſpecks near the Shoulder, which are not ſeen in the next.

S. B. 6. 19. 19. Papiliunculus *Philippenſis* cæruleus minor, ſubtus marmoreatus.

S. B. 6. 20. 20. Papiliunculus *Philippenſis* cæruleus minor, ſubtus maculatus.

Muſ. Petiv. 318. This comes next to our *Blue Argus* Muſ. *Petiver.* 318. but is leſs.

III. *A Letter from Mr* Jonathan Kay, *Chyrurgeon in* Newport, Shropſhire; *concerning a ſtrange Cancer, of which his Father dyed.*

March *the 4th*, 170$\frac{1}{2}$.

IN your laſt you deſired an account of my Father's Cancer, which I here ſend you, as near as I can remember, it being 20 years ſince he dyed, and I being then but young, could not make thoſe remarks upon it, as another might have done, and it's poſſible might forget ſomething material too. It took its riſe from a ſmall bruiſe on the *Os Jugale*, and in proceſs of time ſpread it ſelf over the whole Cheek; and notwithſtanding the endeavours of the moſt eminent Surgeons in thoſe parts where he lived, *viz. Morrey* of *Cheſter*, *Clarke* of *Bridgnorth*, and *Cotton* of *Burton upon Trent*, it ulcerated his Eye round, which I ſaw him take out with his own Hand; and afterwards extended it ſelf to his Ear, and through his Cheek into his Mouth, and acroſs the upper part of his Noſe, and perforated the Bone there: It likewiſe overrun that ſide of his Forehead, fouling the *Os Frontis*, which came away in pieces, leaving the *Dura Mater* bare as broad as a Half-Crown; which riſing through the perforation of the *Cranium*, in a few days putrified and expoſed the Brain it ſelf, and ſeveral portions of it came away freſh and untainted; and that which is moſt ſtrange, he perfectly retained his ſenſes, and roſe every day to dreſs the Ulcer himſelf, till a conſiderable quantity of the Brain was come away; and when he was confined to his Bed, his Speech firſt failed, and he dyed about 4 days after, his Brain being totally conſumed, and nothing remainmaining in the *Cranium* but a ſmall quantity of black putrid Matter. This to the beſt of my remembrance is the ſumm of all. He had neither *Spaſmus* nor Convulſions of any part all the time of his illneſs.

IV. *Part of a Letter from Mr* Ralph Thoresby, *F. R. S. to the Publiſher, concerning ſeveral obſervables in his* Muſæum, *near* Leeds *in* Yorkſhire.

SIR,

I Remember that upon peruſal of the Catalogue of the Natural Curioſities in my poor *Muſæum*, you deſired a more particular account of the *Skin* of the *Fiſhes Stomach* from the *Indies*; of the *Cryſtal*, and the ways of its *Concretion*; of the *Iron* turned into *Ore*; and of the *Octoedra* from the *Copper Mines* in *Sweden*. The firſt was given me by Mr *Robert Midgley* of this Town, an Ingenious Apothecary, who made 5 Voyages as Surgeon into the *Eaſt Indies*. It is the outward Skin of the Maw of a Fiſh that was taken at *Macaſſar*, *Febr.* 16$\frac{80}{81}$. and was given him at *Batavia* by a *Dutch-man*, who took it out of the Fiſh. That the Fibres or Veſſels do curiouſly and naturally reſemble a Tree, with its Stem, Branches, Leaves, &c. will appear by the encloſed figure of it, which, tho but ſlenderly performed, is the beſt I have time to do now, and is ſo like the Original that it will ſave the labour of any further deſcription, (for 'tis exactly the bigneſs and ſhape of this Draught,) ſave that the Skin is very thin, whitiſh, and tranſparent, and the Veins that compoſe the Stem and greater Branches, are now rather Black than dark Red, as I preſume they were at firſt, the Leaves a ſort of dark and faded Green, variegated. See Tab. 7. fig. 1. The *Cryſtal* with other Natural Curioſities, was given me by the Learned and Ingenious *Dr Jabez Cay of Newcaſtle*, who brought it from *Milan*: And becauſe his deſcription will be much more accurate than I can pretend to, I will make bold therewith, only premiſing his arguments upon a ſort of *Spar* within a *Flint*, ſent me at the ſame time. That within the *Flint* (ſays he) ſeems to differ from the reſt of its ſubſtance, and ſomewhat to reſemble Spar: Tho after all, *Spar* being nothing elſe but a *Criſtalline* ſort of *Lime-ſtone*, it differs not from *Flint* in reality, but only in appearance, *i. e.* in the manner of *Concretion*, tho if the incloſed Matter had in its nature differ'd from the reſt of the Stone, the thing had not been very uncommon, it being uſual enough for Stones (eſpecially thoſe of a globular or oval form) to have Coat upon Coat, and thoſe Coats ſometimes very different one from another, ſome of them ſoft, ſome hard, nay, ſometimes after a long ſpace of time, one of theſe Coats will ſhrink from another, after the manner of a Kernel when the Shell grows dry; and then if the encloſed ſubſtance continue ſoft and marly, they call that Stone *Geodes*; but if ſtony, it makes one of thoſe Rattling Stones that are known by the name of the *Ætites*, or Eagle Stone. To confirm what I have here advanc'd, it were eaſie to prove by many Inſtances that it is no unuſual thing for Stones to encloſe Subſtances of a very differing nature from themſelves; the *Shells* in the *Suſſex Marble* herewith ſent you is one proof of this matter, and the *Stones* found in our *Coal-pits*, and known amongſt the Workmen by the name of *Cat-heads*, may ſerve for another; they are found in a particular *Stratum* near the Coal, and encloſe a *Fern*, or ſometimes *Polypody Leaf* in the middle of them; and for that reaſon being ſtruck with a Hammer very readily break there: I think they are a ſort of *Iron Stone*, akin to that which they call in

Staf-

Staffordſhire Ballmine, and Dr *Liſter*, *Minera ferri pilæformis*; they have it upon the Weſtern Coaſts near *Whitehaven*, and call it there by the name of *Cat-ſcamps*. I have ſeen of it too upon the *Yorkſhire* Coaſts in *Robin Hood*'s Bay: You may if you pleaſe, till I find a better name, call it *Lapis mineræ ferri*, *Pilæformi ſimilis*; *in cujus Meditullio*, *unum vel plura filicis folia repreſentantur*. (I have ſince from my ſaid worthy Friend receiv'd Specimens of both ſorts.) And to give you an inſtance that *one and the ſame piece of Rock does not always ſhoot into Stone at one and the ſame time*, *but firſt one part of it and then another*, and they too not after the ſame regular manner, but irregularly enough, I have ſent you a piece of *Rock Cryſtal*, where you may eaſily obſerve the *modus concreſcendi* in the middle to have differed from that of the outſide, nay, ſometimes I have ſeen in the middle of ſome tranſparent Stones a ſmall drop that never would take the ſolid form of the reſt of the Stone at all. The 3d Curioſity was alſo ſent me from the ſame very kind Friend Dr *Cay*; 'tis a piece of an *Iron-bolt* (2 inches long) found in a *Stone* Quarry, now return'd into *Iron Ore* again; this being a Property that Iron has, and no other Metal, as Dr *Liſter* obſerves in his Journey to *Paris*.

4thly, The *Copper Ore* ſo regulated ſhot into an *Octoedrous* form, was ſent me from *Sweden* by Mr *William Sykes* of *Stockholm* Merchant, it has 8 ſolid Triangles, and conſequently 6 angular points, and is as well of the bigneſs as figure of the encloſed draught of it; my ſaid Couſin receiv'd it from the Copper Groves at *Fallum*, where very many of the ſame form were then found, tho he cannot now get another of them. See Tab. 7. Fig. 2.

V. *Extracts of two Letters from the Reverend Mr* Abraham de la Pryme, *F. R. S. to the Publiſher, concerning Subterraneous Trees, the Bitings of Mad Dogs,* &c.

Thorn, March 14. 170½.

SInce I writ laſt unto you, I have had the good fortune to get two or three very conſiderable new Informations about the great Fir-trees that formerly grew in theſe Levels, which I thought not unworthy of communicaring unto you. Being at *Hatfield* the other day, I was told by ſeveral Gentlemen, that about 20 years ago dy'd one *Saunderſon* of that Town, aged near 80 years, whoſe Father, much of the ſame age, did frequently aſſure him, and other Gentlemen that were curious in the matter, that he could very well remember many hundreds of great Fir-Trees, ſtanding one here and another there, in a languiſhing decaying condition, half as high as Houſes, and ſome higher, whoſe tops were all dead, yet their Boughs and Branches always green and flouriſhing, growing all of them in theſe Levels: And *John Hatfield* of *Hatfield*, Eſq; Councellor at Law, who is not above 40 years of age, has by him a large Twig that his Father pluck'd off from the Sprout of a green and flouriſhing Shrub of Fir that grew from the great Root of one of the ſame kind in theſe Commons. And an old man of *Croul* tells me, that he has heard his Father ſay, that he could remember multitudes of Shrubs and ſmall Fir-Trees growing here while this Country was a Chace, and while the Vert was preſerv'd, before the Drainage. And laſtly, in many old Charters that I have ſeen of the Pious *Roger de Mowbray*, Lord of *Axholm*, who lived in the year 1290.

relating to *Hurſt*, *Bellwood*, *Roſs*, *Santoft*, *&c.* it appears that then all theſe places were cover'd with a great old decaying Foreſt or Wood; and not them only, but alſo all that low Common between *Croul* Cauſey and *Authrop upon Trent*; and tho there be not one ſtick of any ſuch thing now to be ſeen, yet it is not only plainly manifeſt that the ſame was true from the Roots there found, but alſo from the ſaid Roots, that moſt of the Trees that then grew there were Firs. All which were but the after-growth, and Relicts of the famous great Foreſt formerly deſcribed unto you, that was deſtroyed by the Conquering *Romans*. I heartily thank you for your great kindneſs, in convincing me that thoſe Trees ſo oft before mentioned, are Fir-Trees, and not Pitch-Trees, which I call'd by the latter name in ſome of my Letters unto you; that which led me into this Error was not only the Expreſſions of ſome famous Authors, who had not accurately enough diſtinguiſh'd the Trees; but alſo the Deference that I would fain have had to the Honour of the moſt Famous Hero *Julius Cæſar*, who ſo poſitively ſays that no Firs grow in *Britain*: tho indeed I might with reaſon have given as little heed to him in that, as to the next Tree that he mentions, to wit, the Beech, which he excludes alſo; and which is ſo common in every part of this famous Nation.

Thorn, *March* 27. 1702.

IT is certain that nothing advances Knowledge more than a ready and free Communication of what paſſes Curious in every part: So, tho many have writ *de Venenis & de his qui a Canibus Rabidis momorſi fuerunt*, as the Learned *Paræus*, *Donatus*, *Codronchus*, *&c.* and have communicated Relations of ſuch to the Learned World; yet give me leave to add another, that happened in the Family of one of the neareſt Relations of mine in theſe parts, ſome few years ago, upon the bite of a Mad Dog, which may perhaps yield you ſome Speculations not unacceptable, and help to diſcover the ſubtilty of the Poiſon of thoſe Creatures, and how it affects Man.

In 1695. my Brother had a pretty Grey-hound Bitch that had Whelps; ſoon after came a Mad Dog and bit this Bitch unknown to the Family, upon which about 3 weeks after ſhe run mad, and they were forced to kill her; but ſaving her Whelps, becauſe that no ſign of Madneſs appeared in them, in about 3 weeks more they all pull'd out one another's Throats except one, which eſcaping, my Brother's men valued and nouriſh'd, made much of it, and ſtroak'd it: at length, perceiving that it could not lap, nor ſwallow any liquid thing, they put their Fingers in its Mouth, and felt its Tongue and Throat, but finding nothing wrong therein as far as they could diſcover, they let it alone a day or two longer, and then it ran mad and dy'd.

They being thus dead were ſoon forgot, until that about 3 weeks after, my Brothers Servant, a moſt ſtrong laborious Man, that had frequently put his Fingers into the Whelps Mouth, begun to be troubled now and then with an exceeding acute pain in the Head, ſometimes once, ſometimes twice a day, ſo very vehement that he was forc'd to hold his Head with both his hands, to hinder it from riving in two, which fits commonly held him about an hour at a time, in which his Throat would contract, as he ſaid, and his Pulſe tremble, and his Eyes behold every thing of a fiery red colour. Thus was he tormented for a whole week together, but being of a ſtrong conſtitution, and returning to his Labour in every Interval, he ſweat and wrought it off, without any Phyſic.

But it went worſe with one of his fellow Servants, a young Apprentice of about 14 years of age, who had made as much of the Whelp as he, but was not of ſo ſtrong a Conſtitution, he was ſeiz'd alſo with a pain in his Head, was ſomewhat Feveriſh, ſometimes better, ſometimes worſe, cough'd much, had a good ſtomach, eat heartily, but could drink nothing. I know not what I ail, ſays he, I cannot ſwallow any Beer, *&c.* and ſo laugh'd at it. When he went out of door, tho there was but a little North Wind, yet he always ran as if it had been for his life; when they ask'd him why he did ſo, he told them he could not tell——but that the Wind would needs ſtop his breath. A day or two after this he was worſe, and vomited a ſtrange naſty ſort of Matter, like black Blood, which ſtunk like Sallet Oyl, but much ſtronger; which he did ſeveral times; after which he would be pretty well, and walk about, but moſt commonly ran as faſt as ever he could, firſt out of one corner, then into another, then up ſtairs, then down again, as if it was for his life. But upon the third day of his confinement within doors he grew perfectly mad, would ſtart, and leap, and twiſt his Hands and Arms together, point at people, and laugh and talk any thing that came in his mind. In ſome of his fits he was ſo ſtrong that he was too hard for four young men to hold him down in the Chair where he ſat: but as ſoon as they were over he was lightſome, and laugh'd, and talk'd, but all his diſcourſe was of fighting, and how if that they would but let him alone, he would leap upon them, and bite, and tear them to pieces: And when one ſaid unto him, that he was ſure that he would not hurt him, he'd been always his Friend; he anſwer'd ſharply, that friends and foes were all alike to him, he'd tear them all in pieces, *&c.* About an hour after his fit came again, which ſoon made him ſpeechleſs, ſeiz'd wholly upon his Brain, and then he dy'd juſt before the Phyſician came.

Sir, I will not here preſume to ſearch into the Particles of this Poyſon, what figure they are of, and how they multiply, how they are able to infect a maſs of other particles millions of times bigger than themſelves, and deſtroy and diſſolve thoſe moſt curious Bodies that are ſo fearfully and ſo wonderfully made. Neither will I conjecture why they ſhould lye ſo long, commonly 3 weeks or a month, and oftentimes much longer, before that they begin to ſtir; why Water, or Beer, or any Cold Liquid is againſt them, *&c.* becauſe that ſuch things cannot certainly be known but by great Niceneſs, and repeated Labour and Inſpection. 'Tis pity that the moſt Noble of Creatures lyes at the Mercy of the moſt Ignoble of Particles; and moſt wonderful that a few Atoms ſhould be able to deſtroy a whole World, millions of times bigger than themſelves.

Roger Mowbray, mention'd in my laſt Letter, did not live in 1390, as I writ by miſtake, but in 1100; ſo that what I ſaid about ſome Reliques of old Foreſts of Fir then ſtanding in theſe Levels, is more obſervable than I thought of.

V. *Part of a Letter from Mr* Alex. Stuart, *(a Phyſician) to the Publiſher, concerning ſome Spouts he obſerved in the* Mediterranean.

S I R,

I Preſume to give you the following Accompt of ſome Waterſpouts (as they are commonly called) which I ſaw lately in the *Medditeranean Sea.*

The 27th of *Auguſt*, 1701. being upon the Coaſt of *Barbary*, to the Northward of the Town of *Bona*, upwards of 10 Leagues diſtance at Sea, about 7 a Clock at night, ſhortly after Sun-ſetting appeared in the N. E. (which was directly up the Gulf of *Lyons* from us) great and continued Flaſhes of Lightning one after another, without hardly any intermiſſion,

miſſion, and this without Thunder continued till the next morning; the Flaſhes of Lightning ſometimes repreſenting the ſudden appearance of a Star, and at other times of a Flaming Sword, and again of a Silver Cord ſtretched along the Clouds, or as the irregular rents of a Vyal from top to bottom.

About 8 next morning we had Thundring, with a continuation of Lightning of the kind and appearance abovementioned, all from the N. E. or thereby.

About 9 the ſame morning, fell down from the Clouds (which lookt diſmally black, lowring, and as it were heavy with Rain) in the ſaid N. E. quarter, three Waterſpouts (as commonly called) that in the middle being the greateſt ſeem'd ſo big as the Maſt of a Ship, and I judged it to be at leaſt a League and a half diſtant from us; ſo that in it ſelf no doubt it was bigger than three Maſts. The other two were not by half ſo big. All of them black, as the Cloud from whence they fell. All of them ſmooth, without any knot or irregularity; only at firſt falling, ſome fell perpendicularly down, and ſome obliquely, and all of them ſmaller at the lower end than above, giving the repreſentation of a Sword; ſometimes alſo one of 'em would bow it ſelf, and again become ſtrait, and alſo ſometimes became ſmaller, and again increaſed its bulk; ſometimes it would diſappear, and immediately fall down again; ſometimes it became extenuated to the ſmallneſs of a Rope, and again became groſs as before.

There was always a great boyling and flying up of the Water of the Sea, as in a *Jette d' eau*, or Water-work; or this riſing of the Water had the appearance of a ſmoaking Chimney in a calm day. Some yards above the ſurface of the Sea the Water ſtood as a Column or Pillar and then ſpread it ſelf, and was diſſipated as ſmoak: And the Sword-like Spout from the Clouds either came down to the very middle of this Pillar, and as it had been joyned with it, as the greateſt, which fell perpendicularly down, ſtill did from beginning to end: Or elſe it pointed to this Column of Water, at ſome diſtance, either in a perpendicular or oblique Line, as did the other two leſſer.

There were three or four Spouts more, which appeared at the ſame time in the ſame quarter of the Heavens, but neither for bulk or duration like to theſe three: Thoſe appeared or diſappeared ſeveral times, during the Continuance of theſe three aforeſaid.

It was hardly diſtinguiſhable whether the Sword-like Spout fell firſt down from the Cloud, or the Pillar of Water roſe firſt from the Sea, both appearing oppoſite to one another all of the ſudden, as in the twinkling of an Eye. Only I obſerved of one, that the Water boyled up from the Sea to a great height, without the leaſt appearance of a Spout pointing to it either perpendicularly or obliquely, and here the Water of the Sea never came together in the form of a Pillar or a Column, but did fly up ſcatteredly, the Sea being in a boyling rage round the place. The Wind being then N. E. the ſaid boyling advanced towards the S. W. as a flitting or moving Buſh upon the ſurface of the Sea, and at laſt ceaſed. This proves that the boyling or flying up of the Water of the Sea may begin before the Spout from the Cloud appears to us: and indeed if there be any ſmall matter of priority betwixt theſe two appearances, the boyling or throwing up of the Sea-Water has it: Which begins firſt to boyl, and then frames it ſelf into a Pillar of Water, eſpecially on the lower part thereof.

It was obſervable of all of them, but more perceptible of the great one, that towards the end it began to appear like a hollow Canal, only black in the borders, but white in the middle; and tho at firſt it was altogether black and opaque, yet no one could very diſtinctly perceive the Sea Water to fly up alongſt the middle of this Canal, as Smoak up a Chimney, and that with great ſwiftneſs, and very perceptible motion: And then ſhortly after the Spout or Canal brake in the middle, and diſappeared by little and little, the boyling up, yea, the Pillar-like form of the Sea-Water continuing ſtill the laſt, yea, for ſome conſiderable time after the Spout diſappeared, and perhaps till the Spout appeared again, or reformed it ſelf, which it commonly did in the ſame place as before, breaking and forming it ſelf again ſeveral times in a quarter of an hour, or half an hours time.

The middle one of the three, as I have ſaid, exceeded all the reſt in Bigneſs, Perpendicularity, Conſtancy of Form and Situation, as well as Duration; but at laſt vaniſhed, as is above ſet down.

I know not, Sir, if any has accompted for this *Phænomenon*, but I imagine it may beſolved by Suction (improperly ſo called) or rather Pulſion, as in the application of a Cupping-glaſs to the Fleſh, the Air being firſt voided by the kindled Flax.

I have ſubjoyned the Figures of the Spouts as exactly as I could.

It was further obſervable (which I had almoſt forgot) That the oblique Spouts pointed always from the Wind; that is, that the Wind being at N. E. the oblique Spouts always pointed to the S. W. tho at the ſame time and moment there were others perpendicular, which remained ſtill ſo, notwithſtanding the Wind.

Alſo that ſuch as were curved had ſtill the Convex ſide from the Wind, and the Concave towards it; that is, the Wind being at N. E. the Concave was towards the N. E. and the Convex towards the S. W.

It rained a great deal during the continuance of theſe Spouts, and after their total diſappearance we had half an hours violent gale of Wind from the N. E. with very little Rain, thereafter the Weather cleared up.

The Explication of the Tables.

Tab. 1.

A The Spout of a Black Colour, falling out of a Black Cloud perpendicularly.

B The Water of the Sea, riſing in the form of a Pillar or Column in the middle, and ſcattered round about the ſaid middle Column, in form of Smoak, or rather like the falling of a *Jette d' eau.* Theſe two meet one another directly, and the Column of Water from the Sea is commonly groſſer than the Spout from the Clouds.

Tab. 2.

A a Curved Spout, joining with the riſing Water of the Sea at B.

Tab. 3. Fig. 1.

A In Fig. 1. repreſents a Black Spout, falling obliquely from the Clouds of the ſame colour.

B Repreſents the aſcending Column of the Sea Water as in Tab. 1. With this difference that here the Spout and Column of Water meet not.

Fig. 2.

E and W in this Fig. 2. ſignifie Eaſt and Weſt.

1 2 3 Repreſent the ſucceſſive progreſſion of the boyling of the Sea from Eaſt to Weſt, or from N. E. to S. W. and that without any appearance of a Spout from the Clouds, pointing to either of theſe places.

Tab. 4.

A Repreſents the big perpendicular Spout a little before its breaking, white in the middle.

B The Column of Sea Water joining therewith.

2 2 2 2 The Water of the Sea, aſcending in the form of Smoak up a Chimney, all alongſt the Column at B to the Clouds.

Tab. 5. Fig. 1.

A The breaking of a perpendicular Spout, commonly beginning in the middle at a.

B The Riſe of the Sea Water, which begins to fail, and the middle Column to diſappear.

Fig. 2.

A an Oblique Spout, which after reaching to the Sea in a Curved Line or Obtuſe Angle, does ſhortly after break at a, and diſappears.

B The riſing of the Sea Water alſo beginning to ceaſe.

Tab. 6. Fig. 1.

A a perpendicular Spout beginning to fall.

B The beginning aſcent of the Water of the Sea under it.

Fig. 2.

A One Oblique Spout beginning or darting it ſelf out of the Clouds.

B The Riſing or boyling of the Water, anſwering to it in an oblique Line.

Theſe ſometimes reach down to the Sea or riſing Water, and ſometimes they do not reach thither, but continue a while as here repreſented.

VI. An Account of a Book, *viz.*

Edmundi Dickenſoni M. D. Phyſica vetus & vera, ſive, Tractatus de Naturali veritate hexameri Moſaici. Per quem Probatur in hiſtoria Creationis cum generationis Univerſæ methodum atq; modum, tum veræ Philoſophiæ principia, ſtrictim atq; Breviter tradi. Londini 1702. *in* 4o.

MAny perſons having cavill'd at the *Moſaical Coſmopæia,* as unphiloſophically written, this Learned Author here takes upon him to ſhew, that *Moſes*, in his Hiſtory of the Creation, has briefly deliver'd both the principles of true Philoſophy, and the method and manner of all generation. Undertaking to elucidate the *Moſaick Philoſophy*, and conceiving it cannot be better done, than by the Corpuſcularian, or Atomical Philoſophy (as being moſt fitted for explaining and proving the generation of things)he has thought it neceſſary, in the firſt place, to remove that great prejudice, which many learned men have had againſt this kind of Philoſophy ; and having intimated its Antiquity, he ſays that all the ancient *Greek* Corpuſcularian Philoſophers before *Anaximander*, who was Diſciple and Succeſſor to *Thales*, maintain'd a Deity ; which he denyed, and initiated many Atheiſtical Philoſophers among the *Ionicks*, till *Anaxagoras*, that famous Corpuſcularian, reſtored the Doctrine of *Thales*, and to the Particles of Corpuſcles (as *Thales* had done before) added a mind, that is, God to work all things ; and the Author ſays, afterward all (excepting *Epicurus*, and his followers) granting theſe Principles, were ſo far from thinking the

World could be made by chance, that they held an infinite Wiſdom, or mind directing all things, that is, a God wholly neceſſary for it, who from an inform and confus'd matter, made and eſtabliſht this wonderful order and ornament we ſee.

He urges the excellency of the *Moſaick Philoſophy* from its Antiquity, as having been deriv'd by a continued Tradition from our firſt Parents. That *Noah* receiv'd it, and his Sons, eſpecially *Sem* and *Japheth*, it is not to be doubted; who we may believe took care to convey it to Poſterity, and tho mankind fell by degrees from Piety to a Licentiouſneſs in all Vice; ſo that all, in a manner, neglected, or wholly deſpis'd their Creator, whereby their minds were blinded, as to the notions they had imbib'd concerning God and Nature; ſo that whatever Doctrines they ſet up afterward concerning beginnings, were very obſcure and imperfect, or trivial and falſe: Yet in the Family of *Heber* the true knowledge continued longer, who deliver'd it to the *Hebrews* deſcended from him. And he thinks no principles of Philoſophy may be found, which more aptly agree both to Chemical and Mechanical experience, or ſo fitly quadrate to thoſe things that now offer, as thoſe which may be form'd and drawn according to the ſeat of the *Moſaick Wiſdom*, and then he lays down the four following propoſitions as a foundation to build his Doctrine upon.

1. That the wiſdom of the *Moſaick Coſmology* can ſcarce be underſtood, unleſs we firſt know thoſe Principles of Philoſophy which *Moſes* had regard to, when he apply'd himſelf to write of the origin of all things.

2. Thoſe principles can neither be diſcerned by reaſon, nor be well conjectur'd at, unleſs we firſt know what principles of Philoſophy prevail'd in that Age.

3. That the Philoſophy of that Age was Corpuſculary, holding that whatſoever was contain'd within the Heav'ns

and Terraqueous Globe, was made of moſt ſubtle Particles.

4. That this way of Philoſophizing did not only prevail over one or two Provinces; but was diffus'd in a manner thro all Nations, who apply'd themſelves to the ſpeculation of Nature, tho eſpecially (as 'tis believed) thro *Phænicia*, *Ægypt*, *Idumæa* and *Arabia*.

Upon a diligent enquiry after that knowledge of Nature, in which the Sons of *Noah* formerly concurr'd, no explication of Nature ſeems to him more favoured, none more true and ancient, than that which teaches that all concretions made from the beginning, and all Generations afterwards, riſe from Minute Corpuſcles or Atoms. Theſe, he ſays, were thoſe principles of Philoſophizing, which all natural Philoſophers, *Ægyptians*, *Phænicians*, *Arabians*, *Hebrews*, *Syrians*, *Indians*, *Brittains* and *Greeks*, embrac'd from all Ancient time, and which were us'd as Keys for opening the ſecrets of Nature, till about the year of the World 3560.

Now, he ſays, tho the moſt Ancient Sages, both before and after the Flood, had the ſame ſentiments of the nature of things, and laid down the ſame Foundation of Philoſophizing; yet they gave not the ſame names to their Principles; for ſome called the matter of all things to be generated, *Waters*, others either *Sand* or *Duſt*, or *Particles*, or *Atoms*, or *Monads*, as the *Pythagoreans*. The *Hebrew* Technical word which is given to the principle of natural things is *Chink*, which ſignifies *Sand*, and the *Arabick* word is *Hiule* or *Hiul*, which ſignifies the *firſt matter*, and alſo *Sand* from *halà*, which is to pour forth *Sand*, whence *halon* is poured forth. Now from theſe *Hebrew* and *Arabick* words the *Ægyptians*, *Syrians* and *Greeks* took their word *hyle*, to denote the ſame, and the *Phænicians*, *Ilus*: both which words alſo at firſt ſignified minute Particles ſever'd like Sand. *Moſes* firſt call'd all the Matter, of which the World was made, Heav'n and

Earth, then Earth alone, then, by reaſon of the Profundity, the Abyſs, and then Waters, tho he ſcarce thinks this word was firſt us'd by *Moſes*, to notify the Mter of the World; but looks upon it as in uſe with Philoſophers for ſome Ages before; and, perhaps before the times of *Abraham*, becauſe we read that the *Druides* in *Europe*, and the *Brachmans* in *India* always thought Water to be the principle of things, and there are Learned men that ſay, the latter were taught their Philoſophy by *Abraham*; and *Megaſthones* in his *India* ſays, that the ſame principles of Philoſophy that flouriſht in *Greece*, were Antiently uſed in *India* among the *Brachmans*; and, if we believe *Aventinus*, in the time of *Hermion*, King of the *Germans*, who Reign'd when *Iſaac* was not 40 years of Age, *Colledges* of the *Druides* were flouriſhing.

Next, having premitted ſome things concerning the *Chaos* and the extent of the *Moſaick Creation*, he proceeds to give an account of the *ſix days works*, where he has ſhewn much Learning in ſetting forth how all things paſt in a natural order. Then he tells us of the Creation of Matter, or the *Chaos*, contrary to the opinion of thoſe who held Matter eternal, wrongly grounding themſelves on this *Maxim*, *Nothing is made of nothing*; which *Maxim* was introduced by the firſt Philoſophers, who were *Corpuſcularians*, and held only two principles of all Generations, *viz.* an active Power, which was Spiritual and Incorporeal, and a Paſſive, *viz. Matter*, and apprehended nothing in the Nature of Body, beſide matter various ways diſpoſed by magnitude, figure, life and motion; or reſt, conceiving in no Generation, a new ſubſtance to be produced, but only the old to be mixt and chang'd after other ways, ſo that a new ſpecies of things ariſes, as another mixture and turn of matter give it new forms and qualities; not that they thought thoſe forms and qualities had a real exiſtence in that thing, to which they were ſaid to belong; but that they are only our ſenſations, to which they ſeem to have a being, for if they had a real being, new entities would ariſe daily from nothing by ordinary generations, which would be abſurd to think. Therefore they wiſely inculcated the above-mention'd *Maxime*, *Nothing is generated of nothing*, *viz.* by the power of Nature; for they underſtood it of natural productions, and brought it in, to take away qualities and ſubſtantial forms. But Philoſophers of after ages wreſted the force of that *Maxime* to ſet up an æternity of Matter, conceiving it abſolutely and always neceſſary that whatſoever ariſes be generated from another thing, either becauſe they thought that nothing but what is material and corporeal ever exiſted, which becauſe it could not make it ſelf, they believ'd to be eternal: or if they denyed not an Immaterial power, or a God, yet they conſider'd not his omnipotency, as able to create matter of nothing: or if they thought it could be created by God, why do they think it was not created, but exiſted before the World was made; ſince Matter exiſting, nothing was wanting but motion for the formation of the Heav'ns and Earth.

Speaking concerning the motion of Matter, he ſays, God gave it that motion, and at the motion of the Matter, which he excited, he created that power which we call Nature, this being nothing but the motion of Matter, made according to the Laws, which the prime Author of Nature eſtabliſht in the beginning.

He treats next of the primigenial Fire and Light, or of the firſt Heaven, and ſhews after what order it was made, upon a motion of the Particles; and ſays, it pleas'd God among thoſe works which he put under the Laws of Nature, from the beginning, to inſtitute ſome great Miracles here and there, above the power of Nature, more ſignally to ſhew he was Lord of the frame of the world, and that the Divine Mind is always to give rule to Nature: and ſhews by many Suggeſtions and Chymical Experiments, that it's no abſurdity in Reaſon to admit the Su-

per-

percæleſtial Waters intimated by *Moſes*, whatſoever ſome may object.

Treating of the *Expanſum*, or Inferiour Heav'n, he ſays that according to the *Moſaick Phyſiology*, the Heav'ns, generated of the Abyſſine, or Chaotick Waters, are divided only into two Orbs, call'd by the names of the Superiour and Inferiour Heav'ns (tho others have made ſeveral Cæleſtial Orbs) and having ſpoke of the Superiour Heav'n in the foregoing Chapter, he tells us here, that the Inferiour Heav'n, the work of the ſecond day, is call'd by *Moſes* the *Expanſum*, and comprehends all the ſpace from the Terraqueous Orb to the Empyreal Heav'n, or the Æther; tho with this diſtinction, that its ſuperiour part, which is far the greater, is call'd Sidereal ; the Inferiour, next the Earth, Aerial : and then he tells us how this Inferiour Heav'n was fram'd : and as for the *Cælum Cœlorum*, mention'd by *Moſes*, call'd by *S. Paul* the *Third Heav'n*, he ſays, It's a Supramundane Light, to which no Mortal can have acceſs.

Treating of the Chaotick or Elementary Waters, he ſays, that tho *Moſes*, and the *Brachmans* and the *Druides*, long before him, ſaid Water was the principle of all things, yet he thinks neither *Moſes* nor the others underſtood it to be true or natural Water, but only *Metaphyſical*, *viz.* that Immenſe Multitude of Chaotick particles, of which all things were made in the beginning ; which when they were moved by God, preſented an appearance, as it were, of Waters ; nor is the nature of Water, ſpeaking Philoſophically, any thing but a multitude of round and ſmooth Particles circulating about their Center : and he produces many arguments for making out what he has here laid down.

Treating of the Chaotical and Elementary Earth, he tells us of the great delight Nature takes in changing all things, and making again the like. This, he ſays, can be perform'd in all Elements, even by the Induſtry of

Art: So not only the Solar Fire, every where diffus'd in the rays of the Sun, but likewiſe the Kitchin Flame may be made Earth by Nature and the help of Art; this the burning of Brick in a Brickill, and the Calcination of Antimony by the rays of the Sun, evidently ſhew, ſince upon burning (tho many parts fly away in ſteams and ſmoak) they get a conſiderable increaſe and weight, the fiery particles being detain'd in the Burnt thing, and ſo turn'd into an Earthly Nature. Nor is the Converſion of the Solar Fire into Earth unknown to skilful Chymiſts, who ſo prepare ſeveral dry things, that they magnetically attract the moſt fervent Rays of the Sun, and ſo retain them, that they get an egregious and dry weight: and the *Hermetick Sages* owe a great part of their *Natural Tincture* to the flame of Fire. Again, he tells us, the Earth itſelf (but firſt turn'd into Salt) can be wholly turn'd into Water; and the moſt pure Water, by a very ſtrong and tedious diſtillation, without any addition, or ſcarce any diminution, may be made a white Earth. Nor does he doubt but the Air alſo, as well by other ways, as by a violent agitation and concuſſion of its parts (ſuch as is made by the Water, and a diſcharging Guns, eſpecially of thoſe which are charg'd with Air alone vehemently compreſs'd) may be ſo broken and attenuated, that its broken fine Particles, being joyn'd and affixt anew afterward, either to themſelves, or to other particles, may make either Fiery, or Watery, or perhaps Earthly concretions, which being now become heavy, the *Elaſtick force* of the Air drives to the Earth.

Treating of the *Ægyptian Iſraelites*, to ſhew that they were not ſo ſtupidly Ignorant, as ſome pretend they were, and Incapable of a Philoſophical Inſtruction from *Moſes*, he ſays it's known, all the poſterity of *Iſrael* were call'd the Sons and Houſe of *Iſrael*; and ſo the poſterity of *Abraham* were call'd his Houſe and Sons, whom he commanded to keep the ways of *Jehovah*, which were that ſecret path of wiſdom, Which is the knowledge of divine and humane things, and of the Cauſes in which theſe hings are contain'd; wherefore we may believe that *Abraham* train'd his Houſe, which grew up to a People, or Nation, in Divine, Moral, and Natural Knowledge. *Eupolemus* teſtifies that *Abraham* was moſt familiarly converſant with the *Heliopolitan Prieſts* in *Ægypt*, and taught them thoſe Sciences he brought with him eſpecially the Cæleſtial Science, *Aſtrology*. Vales *Jacob* had been well skill'd in Nature, and well ſeen in the ways of raiſing and fortifying the Imagination, and had alſo known the efficacy and property of the rods he us'd, and had well conſider'd the powers of the Stars and fit Seaſons, or he had not provided to himſelf ſo many ſpotted and ring-ſtreak'd Sheep. The ſame Learning was in his Children, and continued in vigour among their poſterity: So that *Theophraſtus* ſays the *Jews* were naturally Philoſophers, they were ſo train'd to it from their youth. Many more arguments he produces, for proving the continuance of good Learning amongſt the *Hebrews*, and that it was ſuppreſt by their Slavery in *Ægypt*.

Treating concerning *Moſes*, he ſays there were but ſix men betwixt him and *Adam*, *viz.* *Methuſalem*, *Noah*, *Sem*, *Iſaac*, *Joſeph* and *Amram*, *Moſes*'s Father; ſo that if we allow not *Moſes* to have receiv'd his knowledge by inſpiration from God, we cannot doubt but he receiv'd by Tradition whatſoever there was of Learning among the *Antediluvian fathers*, and to have learnt the origine of the Univerſe. He ſays, it's well known *Aſtrology* and *Chymiſtry* flouriſht in *Ægypt* in the time of *Moſes*, by which the Inward natures of Cæleſtial and Terreſtrial things are made known, his skill in Chymiſtry appear'd by his reducing the *Golden Calf* to a Powder, and diſſolving it in common-water: And he ſays there is a ready method, known only to Philoſophers, by which method Gold, having a ſceret Powder put into it, is preſently made a Powder diſſolvable in Water, and he conceives this way was uſed by *Moſes*. If it be objected, it's no way likely that *Moſes* turn'd the *Golden Calf* into Powder by *Chymiſtry*, but as it's expreſsly ſaid) by burning; and that it's not probable *Moſes* knew that Art, of which no mention is made in Sacred or Prophane Writers, it being a new Invention which no man mention'd before *Julius Firmicus*, who writ about the time of the Emperor *Conſtantine*. To this he anſwers, He owns no expreſs mention is made of it in the *Scriptures*, but he thinks they enforce us by a neceſſity of Conſequence to believe that *Moſes* ſometimes did ſomething great by that Science. And he ſays it's clearly prov'd, the Science of *Chymiſtry* was much more ancient than *Moſes*, by thoſe many things which are ſaid of *Tubal Cain* or *Vulcan*; ſince when *Moſes* ſaid he was a Maſter of every Artifice in Iron and Braſs, all the ancient Sages underſtood it of his Skill in Chymiſtry. Hence the *Ægyptians*, in that Temple which at *Memphis* was dedicated to *Vulcan*, erected a School of Chymiſtry, which there long flouriſh'd, as we are told by *Zozimus*, *Panopolites*, *Euſebius*, *Syneſius*, and others. And *Abulpharagius* tells us, he found in ancient Records, that in *Ægypt*, after the Deluge, they were Learned in many Sciences, and eſpecially in the Sciences of *Chymiſtry*, *Taliſmans*, and *Burning-glaſſes*. He adds one argument for the Antiquity of *Chymiſtry*, from *Gen. 6.* where *Jehovah* commands *Noah* to make a clear light for the uſe of the Ark, which he deſires leave of the Learned to believe, was a ſplendour of a Fiery and Sulphureous Liquor prepared by the Artifice of *Noah*, and put in Veſſels of the *Lapis Specularis*, or of *Cryſtal*, or, haply, of *Glaſs*, and hung in ſuch places of the *Ark*, to enlighten all the Cells of the Animals: The ſubtle *effluvia* of the Liquor alſo ſupported and kept in health the Animals without that groſs food, which might otherwiſe have been neceſſary for them, and would have requir'd more room for ſtowage than may well be accounted for, according to thoſe dimenſions we have of the Ark: And this he endeavours to make out by many ſuggeſtions.

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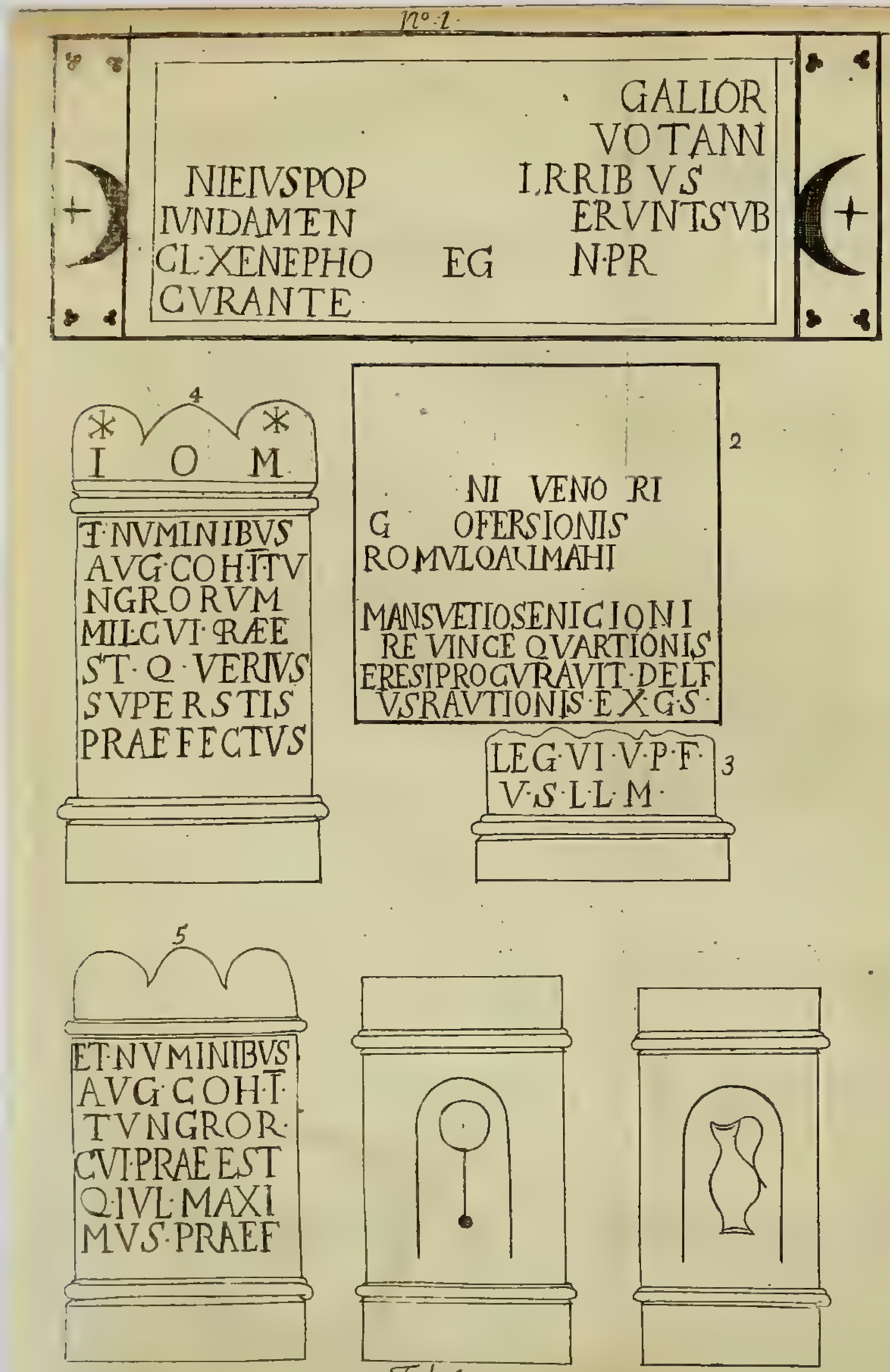

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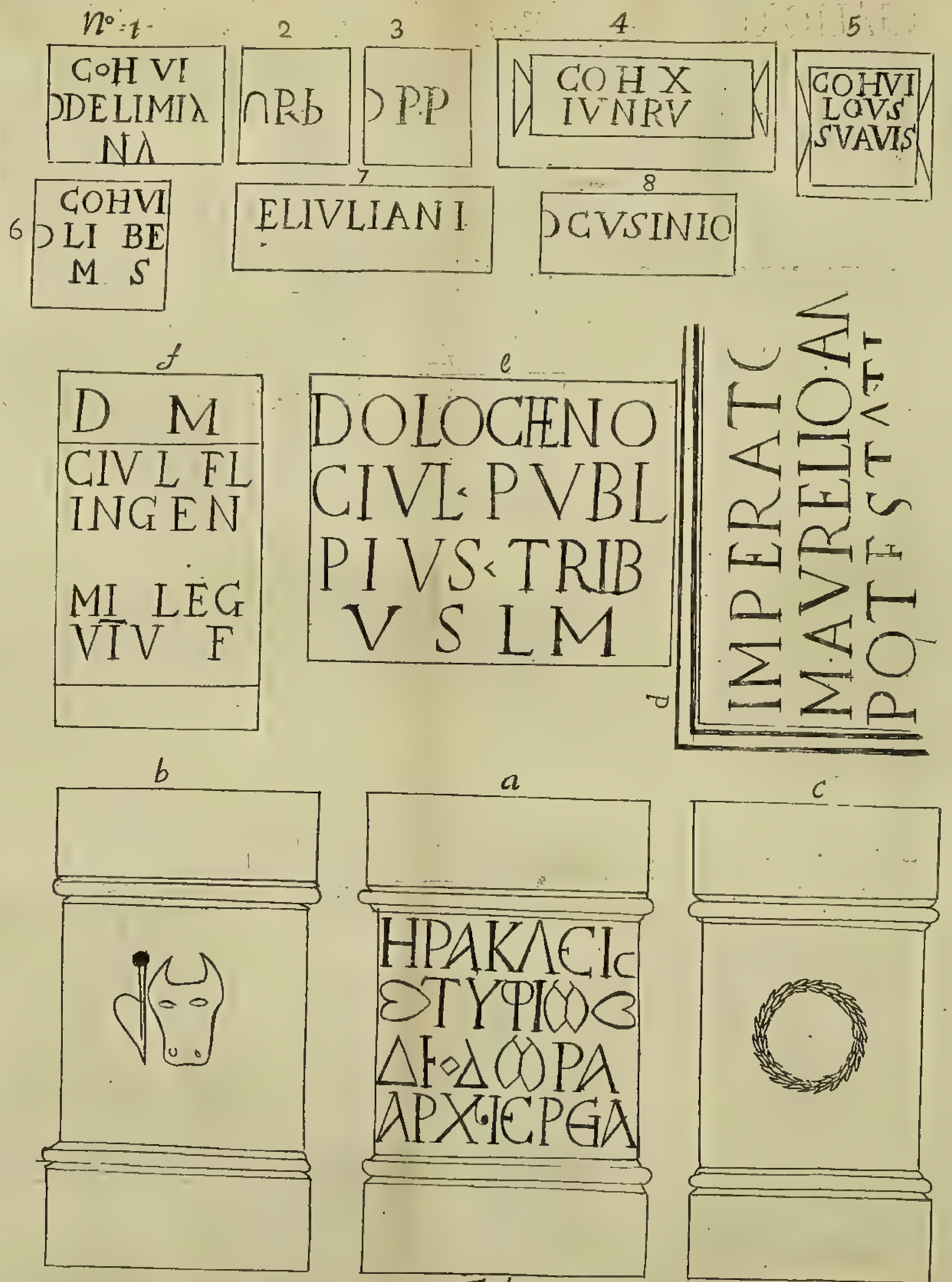

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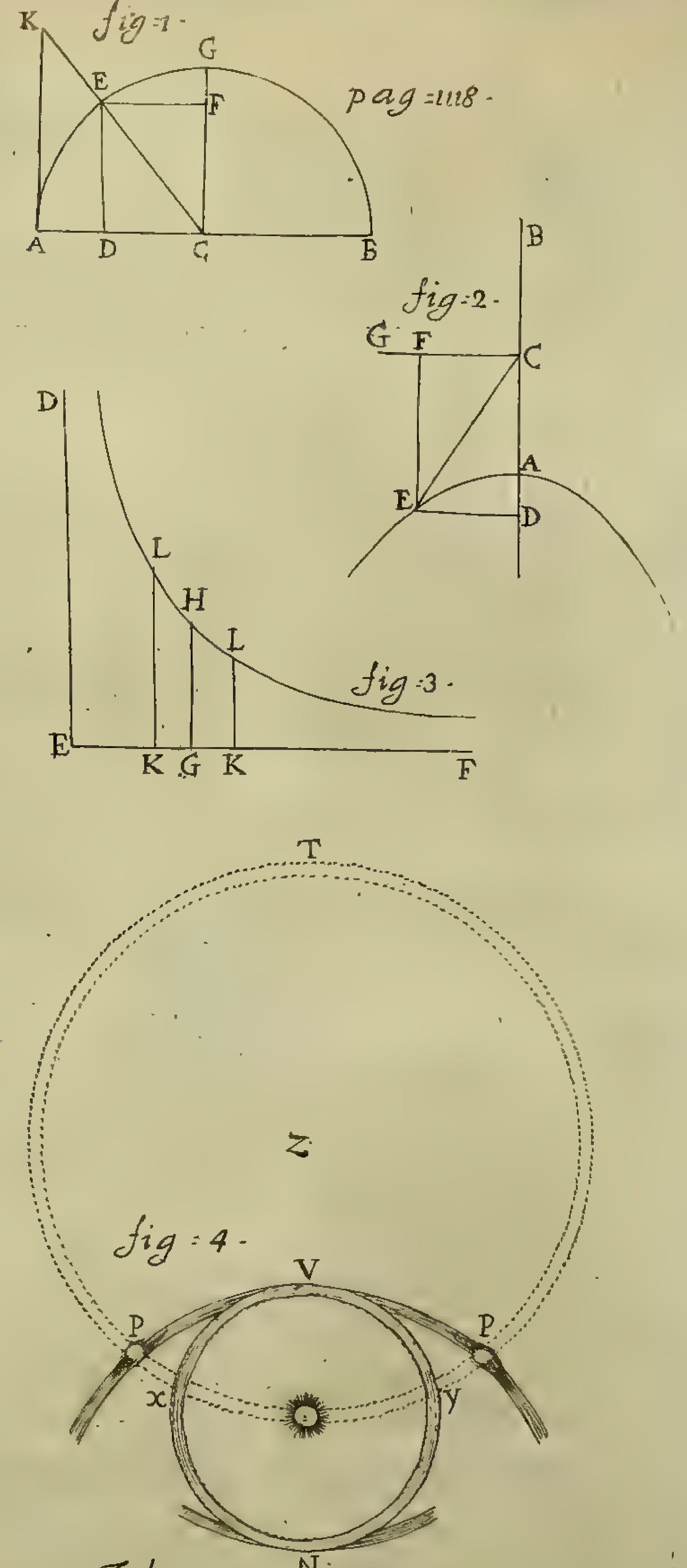

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PHILOSOPHICAL TRANSACTIONS.

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I. *Obſervations made in the Iſland of* Ceilan, *by Mr* Strachan *on the ways of catching Fowl and Deer, of Serpents, of the ant bear and of Cinamon.*

THe way they catch Water-Fowls is this, in Loughs and Waters which are not very deep, the Fowler puts an Earthen Pot upon his Head, in which Pot are bored holes, through which he may ſee, then he wadeth in the Water, nothing being ſeen but the Pot which covereth his Head, and thus enters in the midſt of all the Fowls, they thinking it to be a Block or the like driving, do not take notice of it, although it be upon their ſide; then he takes hold of one by his Foot, and draws him under Water, and wrings his Neck about; the reſt of the Fowls not perceiving this ſit ſtill, then he goes to the next Fowl and does the ſame; and ſo going forth he catches as many as he pleaſes.

Thoſe that have Guns, make a Frame, which they cover with green Branches, which are ſo broad as to cover their whole Body. They ſtand behind it; then carrying the Frame before him, the Bird or Deer ſeeing nothing but the green Branches is not affrighted, and thus the Hunter being advanced near enough, gives fire.

It is wonderful to conſider, how ſome Beaſts are affrighted by Fire, as Lyons, Tygers, Wild Swine, and other Beaſts; and as the *Ceilaneſes* chaſe the Elephants, Wild Swine and Tygers from their Plantations by Fire, and the Natives at the *Cape of Good Hope* chaſe the Lyons from their Cattel; ſo alſo do the *Ceilaneſes* catch Harts, Deers, Elks, and Hares, which they perform in this manner. In time of the night two Men go into the Wood, one of theſe takes an Earthen Veſſel upon his Head, wherein is Fire burning, made of Sticks and a kind of Reſine, and in one hand he carries a Staff, whereon are faſtned 8 Bells, which the more harmonious they are, ſo much the better, the other Man goes behind with a Spear in his hand; whenever the Deer perceiveth the Light and hears the Bells, he draws near to it, ſtanding and beholding it as amazed, for he ſees not the Men; in the mean time the Man with the Spear pierceth his Body, and catches him. Now Elephants, Tygers, Serpents and Wild Swine run when they ſee the Fire, ſo that the Hunters need not fear them.

There are two ſorts of Serpents that Capt. *Knox* does not mention, which are thought not to be venemous, and a *Ceilaneſe* will not kill; the firſt is of a Bluiſh colour, and comes frequently into Houſes, and ſearches for Rats only, and eats them; he creeps into their Neſts, and makes a deſtruction among them; he is of the thickneſs of an inch and a half diameter, and about two yards and a half long.

The other is green like a Leaf of a Tree, who winds himſelf, and climbs upon the Trees, and catches the Birds, lying ſtill all the time as if he had no motion, until he ſees a fit opportunity to catch. He is about one half inch diameter, and a yard long.

The *Talgoi* will lye as if he were dead beſide theſe little Neſts which are built by theſe Ants called *Waia*, letting his Tongue ſtick out as far as he can; theſe Ants will immediately fix themſelves in great numbers round about and upon his Tongue, to carry away the ſlime which is upon the Tongue, thus he draws in his Tongue and ſwallows them, and then he ſhoots forth his Tongue again, and continues ſo to do until he has ſatisfied his hunger.

If a Man be lying or ſleeping an Elephant will not mind him. A Company of *Dutch* Souldiers marching from *Columbo* to *Gurbewil*, one of them did ſtay behind to reſt himſelf, and did ſlumber upon the way ſide. An Elephant coming out of the Woods, went (within two paces of him) but when he was paſſed by about 7 or 8 paces, the Souldier did awake and ſee the Elephant, and not thinking it ſafe to run; becauſe the Elephant did not mind him, lay ſtill until he perceived the Elephant to be gone.

There are two ſorts of Cinnamon-Trees, of which the Tree which is eſteemed the beſt has a Leaf much larger and thicker than the other, but otherwiſe no difference is perceived. If theſe Leaves, as well one ſort as the other, be diſtilled, they yield an Oyl and Water, as if Cloves had been in the Still.

Upon the Root of this Tree is a thick Bark, which, when it is diſtilled, as the former, yields Oyl and Camphire alſo; which is ſeparated by covering the Receiver with a Linnen Cloath, and the Camphire will remain in the Cloath in a lump together, and the Oyl and Water will run into the Receiver. This Camphire has the ſame colour, the ſame diſcuſſing, diſſolving and healing Balſamick quality of the Camphire of *Japan*; the Oyl is of the ſame vertue; anointed upon Scabs, Itch and Excoriations, it cures them in a ſhort time.

To drink the Water among common Water cures Fluxes, and does good to thoſe who are under that languiſhing Diſeaſe called by the *Hollanders* the *Lands Diſeaſe*, and by the *Ceilaneſe*, *Pipa*; of which we ſhall make mention at large in its proper place.

I never did ſee the Natives make uſe of Cinnamon, although they ſcarcely have a meal without Pepper: neither is it uſed by the *Europeans* either in Meat, or diſtilled among the Rack, or infuſed in Drink, for it is thought that it occaſions ſhortneſs of Breath; but this I have no experience of; whither this be the cauſe of it, or whither the *Ceilaneſes* are fearful to bring it to particular men, ſeeing the *Hollanders* have ſevere Laws againſt the ſelling of it, I cannot tell.

II. *A Letter written by Monſieur* Blondel *to a Friend, informing him of what paſſed in the laſt publick Aſſembly of the Academy Royal of Sciences at* Paris, *held* Nov. 12. 1701. *Communicated by Monſieur* Geoffroy. *F. R. S.*

SIR,

I Have endeavoured what I could to ſatisfie your commendable Curioſity touching the points of Knowledge, treated of in the laſt publick Aſſembly of the *Academy Royal of Sciences at* Paris, and ſtrove to recal to mind as much as was poſſible, the principal matters faithfully. Yet if there ſhould happen any miſtake in what I write, let it be attributed to me. You know we have not ſo great a command of the Memory, as to be aſſured to fail in nothing, how great ſoever the care be; eſpecially in matters ſo ſublime as thoſe to which the Learned of this *Academy* apply themſelves. Sometimes even the too great deſire to retain all is an hindrance to the vivacity of the Memory: Every thing is fine, every thing worthy to be remembred, yet we cannot retain all, ſo that one is under a great concern to omit nothing conſiderable. This I have found true in my ſelf, and muſt be excuſed if I have committed ſome miſtakes, and you have too much goodneſs not to receive it, as an excuſe.

Monſieur *Caſſini* opened the *Aſſembly* with a Diſcourſe containing the Obſervations he had made in his laſt Voyage, with a deſign to determine the paſſage of a Meridian Line (taken from a point in the *Obſervatory* at *Paris*) from one end of *France* to the other. In the firſt part of this diſcourſe he went back to the moſt ancient Aſtronomers, and recounted their opinions of the Spherick Figure of the Earth, and their methods to know its dimenſion, of which the two moſt famous are, firſt, that of *Eratoſthenes* the *Cyrenian*, who lived in the Reign of *Ptolomie Euergetes* King of *Ægypt :* The ſecond that of *Poſſidonius* of *Rhodes*, who lived in the time of *Pompey* the Great. After having enlarged on the Methods uſed by theſe two Ancient Philoſophers, he proceeded to thoſe of the Moderns, *Johannes Fernelius*, and ſome others : And in the laſt place he related the method of the late Monſieur *Picard*, of the *Academy Royal*, as the moſt exact. Then he ſpoke of his own Obſervations on the ſame ſubject; of the uſe he had made of the *Satellites* of *Jupiter*, more fit for this than the Eclipſes of the Moon, in that they are more frequent; and ſaid that his Obſervations had been confirmed by the like made in *China*. He ſhewed the method he took to determine the paſſage of the *Meridian* taken from a point in the obſervatory at *Paris*. By the means of Triangles which he made through the whole courſe of his Journey, and very exact calculations, he determined the place of this Meridian, and marked all the conſiderable places thro which it paſſed, from *Paris* to the higheſt Mountains of the *Pyreneans*, which ſeparate *Rouſſillon* from *Catalonia*; among theſe Mountains he obſerved one of a prodigious height, it being 1440 Toiſes high. But the moſt extraordinary Obſervation was that of the inequality of the degrees of the Meridian on the Earth; which is ſuch, that Monſieur *Caſſini* found that going Southward one degree ſurpaſſed another an 800th part, which may give great reaſon to doubt of the exact roundneſs of the Earth. Upon this occaſion he reported two different opinions : the one Monſieurs *Huygens* and *Newton*, the other of a Mathematician of *Straſbourg* named *Eiſenſchmidius*. The two former hold that the Earth is flatted towards the Poles, ſo that it is ſomething of the ſhape of an *Holland* Cheeſe: which they both conclude by Phyſical and Algebraical deductions, from an Obſervation made at *Cape-Verd*; that the Pendulums, tho of the ſame length, make their Vibrations there much ſlower than in the Northern Countries. The other Mathematician holds that the figure of the Earth is Elliptique, ſo that it is ſtretcht out toward the Poles, and has the form of an Egg. *Monſieur Caſſini* left the Queſtion undecided. The Cities thro which he obſerved the *Meridian* of *Paris* to paſs, are *Dunkirk*, *Amiens*, *Aubigny*, *Bourges*, *Aurillac*, *Rodez*, *Alby*, and *Carcaſſone*. Monſieur *L' Abbe Bignon*, who at the end of every diſcourſe made a recapitulation of it, ſo exact and true, that the Author himſelf could not give a more faithful extract, ſaid, that the *Meridian* of *Paris* would be obſerved round the whole World with the ſame exactneſs as had been already began to be done from one end of *France* to the other; and that there were perſons of Courage ſufficient to enterprize ſo painful a Voyage; and that nothing hindered them but the War, which now began to be kindled every where. He meant by this Perſon (as he explained himſelf at the end of the Aſſembly) *Monſieur de Chaſel*, Aſſociate of the *Academy Royal*, and Profeſſor of *Hydrography* at *Marſeilles*, who having already made ſeveral Voyages in the *Mediterranean*, in quality of the Kings Engineer, and collected many Obſervations, is now buſied in making a very true and exact Cart thereof, wherein he will ſet down the Anchorages and the leaſt Particularities.

The next of the Academy that ſpoke was Monſieur *Bolduc*. He examined the Principles of Purgatives, and began with *Ipecacuanha*, which he ſaid he had endeavoured to ſweeten and qualifie, by trying to take away its too great *Emetic* power. He aſſured, that how violent ſoever *Ipecacuanha* be, yet it is not ſo dangerous as *Scamony* or *Coloquintida*, which always leave Gripes, and ſometimes *Dyſenteries*; whereas *Ipecacuanha* leaves only a gentle aſtriction aſter it. He ſaid next, that he having obſerv'd that the *Emetick* force of this Root conſiſts in its *Reſinous* parts, he had found out a way to take them from it, and to leave only the *Saline* parts ; that he made uſe of Spirit of Wine to extract the one, and of Rain water diſtilled to draw off the other ; that he had afterwards given with very good ſucceſs in Dyſenteries this *Ipecacuanha* ſo deſpoiled of its *Reſinous* parts. From *Ipecuanha* he paſſed to *Hellebore*, which is another Violent *Emetique* ; which he diſtinguiſht into two ſorts, the Black and the White. He ſaid, that ours was not different from that of the Antients, that the White caus'd mortal Convulſions, for which reaſon it was not uſed, and that he had never made any attempts with it. As for the black *Hellebore* it is to be obſerved, that that which comes by the way of *England* is much weaker than that which grows on the Mountains of *Switzerland* ; which may well have been the reaſon that Phyſicians have neglected this Remedy, then he related his operations on this Root. He ſaid, that having put it in a retort in a Reveberatory Fire, he at firſt drew off an Acid Spirit, next an Oyly Acid Spirit ; thirdly a violent *alkali* Spirit came over mixt with Oyl of *Tartar*, and laſtly a fetid Oyl. That from the *Caput mortuum* he had by a *Lixivium*, a fixt Salt, which fermented with Acids, ſuch as all other Plants give ; beſides theſe Operations, he drew an *Extract* of this Root with Spirit of Wine to get the *Reſinous* parts, and with diſtilled Rain Water for the *Saline*. He got but very few of the former, but a great deal of the other ; ſo that he found that Spirit of Wine was uſeleſs in this caſe. Comparing then the Effects of theſe Purgatives, he ſaid that the purely *Reſinous* purge little, and with much irritation ; that the purely *Saline* purge only by Urine, but that both joyn'd together purge very well. That it is for this reaſon that *Phyſicians* make uſe of Salt of *Tartar*, to correct the bad Effects of *Reſinous* Purgatives ; but if this Precaution were uſed, to make the extract with *aqueous* diſſolvents inſtead of the *ſulphureous*, there would be no need of that Corrective.

Monſieur Morin, who ſpoke thirdly, offer'd a particular project of a new *Syſteme* for the paſſage of the Drink and Urine. He ſaid, that having obſerved the extreme ſwiftneſs with which the drink paſſes ſometimes, as they find that drink *medicinal* Waters, he thence conjectured that it did not always go the way, which *Anatomy* ſhews us it takes ordinarily; and that therefore it ought to have another ſhorter paſſage which is not yet diſcovered. A ſtrong proof of this his conjecture is, that thoſe who purge with an infuſion of *Caſſia* render in a very ſhort time by Urine, a Tincture as black almoſt as the infuſion they have taken; which would not conſtantly happen, if the drink took always the ordinary way. He then took pains to diſcover this unknown paſſage for the Urine, and he perſwades himſelf that he has found it. To make his *Syſtem* the better apprehended, he began with the explication of the uſe of the Drink, which is to help the digeſtion, and to ſerve for a *vehicle* to the *chyle*: He ſaid, that the *Urine* is nothing elſe but the Drink itſelf, which having ſerved for this purpoſe is afterwards caſt out more or leſs loaded, that thoſe who drink much without eating, as when they take the Waters, render their Urine very ſuddenly, and that without colour. On the contrary, they that drink little and eat much, renders theirs ſlower and high coloured; and laſtly, they who both eat and drink very much, render theirs at firſt, one part leſs coloured, and afterwards another part high coloured later.

He did not pretend to give thisSyſtem *as new, but as explained more exactly, and in ſome manner demonſtrated by the Experiments which he reported.*

From whence, and from what he had before ſaid, he inferr'd, that the Drink beſides the ordinary paſſage, which it has to the Bladder by the *emulgent* Veins *Kidneys*, and *Ureters* has likewiſe another by the Pores of the *Stomach*, and of the *Bladder*. He called thoſe the firſt *Urines* which paſs by this new way, and the ſecond *Urines* thoſe that paſs the ordinary way. He afterwards proved the poſſibility of this new *Syſtem* by Experiments. He ſaid, that having taken the *Ventricle* and *Bladder* out of a dead Body, and filled them with Water, it run all out through the Pores; and turning them inſide outwards, the Water that was put in them run thro after the ſame manner; and that laſtly, letting them ſwim in Water, it eaſily ſoaked thro into them. From which he concludes that in a living Body, it ought to paſs with much greater facility by the *Tenſion* of the Stomach, for the *aliment* like a Sponge ſoaks up the *Liquor*, in which it ſwims, and ſo ſwells up the *Stomach*, which in its turn again preſſing the Food; ſqueezes out the Liquor from it, and forces it to filter thro its Pores. With this preſſion it is eaſy to conceive, that the Drink muſt paſs eaſier thro the Pores of the *Stomach* than the Water, which was put into the *Stomach* taken out of a Dead Body; and that this *Liquor* re-entering into the *Bladder* makes the firſt *Urine:* it is evident likewiſe, that this preſſion is never ſtrong enough to preſs out all the *Liquor* from the *Stomach*, and ſo there remains enough to carry on the *Aliment* and *Chyle*, after which it comes away high loaded and coloured, and makes what he calls the ſecond *Urines*. He added, that the paſſage of the Drink into the capacity of the lowerBelly did not cauſe the *Dropſie*, becauſe that *Liquor* aided by the preſſure of the parts that encompaſs it, finds an eaſie entrance into the *Bladder*, and none into the *inteſtines*, becauſe of the thick *Mucus* that lines them. The eaſineſs of this paſſage is the cauſe that *mineral* Waters run away ſo ſuddenly by the firſt ways, and by the ſecond; but much more by the firſt, when there is but little nouriſhment in the Stomach; for there runs more or leſs Urine by the firſt ways than by the ſecond in proportion to the *aliment* taken, and to the Surplus of what is neceſſary for the digeſtion; reſpect being had likewiſe to what paſſes inſenſibly by tranſpiration.

Thy *Syſtem* being ſo laid down, he gave the Reaſons of two conſiderable *Phenomena*.

The firſt was that the different *Colour* of *Urine* that is made at different times, he ſaid, this came from hence; that thoſe that paſs by the firſt ways, are but little charged, whereas the other, that paſs by the ſecond ways, having ſerved for a *Vehicle* to the *Chyle*, and circulated with the maſs of the Blood, are charged with the *Volatile* and *Sulphurous Salts* and other excrements of the Blood, and conſequently more coloured.

The ſecond *Phenomenon*, was the *Red*, *Greeniſh* and ſometimes *blackiſh* colour of the *Urine* of thoſe that are purg'd with the infuſion of *Caſſia*. This, according to him is becauſe that Tincture paſſes by the firſt ways, as was experimented in the *Stomach* of a dead man, where this Liquor paſſes indeed more ſlowly, and in leſs quantity, but always of a *Greeniſh Red*. It is the ſame of the *Red* Tincture of the *Urine* after eating *Beetes*, of the *Violet-brown*, which is obſerved after Drinking *Mineral waters*; of the *ſmell* of *Violets* after the taking Pills of *Turpentine*, and of the ſtrong ſmell after *aſparagus*, all which comes from the firſt *Urines* being charged with that colour and ſmell, which is not taken away by any thing that's mixt with it, whereas the ſecond *Urine* which carries the *Chyle* and *Aliments* has no other colour nor ſmell than *Urine* ordinarily has, he advertiſed at laſt that he had ſpoken only in general, and without mentioning the exceptions; and that he was ready to quit this opinion, whenever good reaſons were given againſt it.

In the end *Monſieur Marchand* cloſed the *Aſſembly* with the Lecture of a diſcourſe of a diſcovery of a new *Simple*, he began with enumerating the advantages Modern *Botaniſts* have above the *Ancient*, in regard the *later* in the ſpace of ſo many Ages diſcovered at moſt not above 6000 Plants, and the *former* in this laſt Age, have found out at leaſt 4000 and among others excellent *Specifiques* as *Ipecacuanha*, *Jeſuits Bark*, *&c.* Whereas the Ancients knew only ſome bad *Purgatives* ſuch as *Scamony* and *Hellebore*.

The Plant of which *Monſieur Marchand* ſpake is none of the leaſt curious Diſcoveries that has been made of this nature. The firſt that brought it into reputation was a *Portugueze Surgeon*, who having lived many years in *Brazil* diſcovered the Virtues of this Plant, after returning into *Portugal* with a deſign to raiſe a great Trade with it, he ſent ſeveral *Specimens* of it every where. He called the Plant *Iquetaia*, and attributed to it no leſs Virtues than the cure of *Apoplexys*, *Pleuriſies* and *Intermitting Fevers*. He added one thing, which tho more particular, yet ſeemed more probable, which was, that the Leaves infus'd with *Senna* took from it, its diſagreeable taſte and ſmell without altering any thing of its *Purgative* quality. The *Samples* that he ſent were not in ſufficient quantity to make experiment on the Diſtempers, he ſaid, it was proper for; but there was enough to try whether they had the virtue to correct the taſte and ſmell of *Senna*. Therefore there was infus'd two *Dracmes* of it with as much *Senna* in a *Chopine* of Water, and the experiment confirmed the matter of fact, being deſirous to know what *Species* of Plant it was, and it being impoſſible to diſcover it by the Leaves the *Portugueſe Surgeon* had taken ſo much care to cut thm very ſmall. Monſieur *Homberg*, who had ſome of it ſent him, perceived ſome Seeds ſwimming on the Water, in which they were infus'd, and taking up as many as he could of theſe Seeds, gave them to *Monſieur Marchand*, who ſowed them, from whence grew up a Plant, which (God be thanked) we need not go to *Brazil* to ſeek, it grows in *Europe*, nor need we go out of *France* to find it; nay, more, we may have it all round *Paris*; 'tis the *Scrophularia aquatica*. To be the more certain of it, there was ſome of our *Scrophularia* ſowed on a Bed, and ſome of the other ſeed on another, and there was obſerved but ſome ſmall differences, which may be well attributed to the different Culture and Soil: There was likewiſe tryed the Vertue of our *Scrophularia*, and it was found to have the ſame effect, in taking away the taſte and ſmell of *Senna. Monſieur Marchand* concluded from this diſcovery, that it was more fit to labour to know the Remedies that are in our own Land, than to run over all the Earth in queſt of that, with much labour and charge, which we may have for nothing at home, if we took the pains to ſearch. He added, that a knowing *Botaniſt* after many long Travels avowed, that there might be found in all Countries Remedies for all Diſeaſes, and that having apply'd himſelf to this matter, he had diſcovered a good number of Simples commonly to be found, that had great Virtues, of which he had graved the Plates. He named among others the *Achillea Montana Penæ*, which ſmoaked in a Pipe as *Tobacco*, conſiderably eaſes an *Aſthma*. This skilful *Botaniſt* he mentioned, was the late *Monſieur Marchand*, his Father, whom out of modeſty he would not name; but whom Monſieur *l'Abbe Bignon*, out of the great Love he bears to Learning and Learned Men, named with much reſpect and commendation. He finiſht his Diſcourſe, with advice to *Phyſicians*, to apply themſelves to the knowledge of what grows in their own Countries, before they think of going farther; he ſaid they ought to neglect nothing, and that they ſhould rake even in the *excrements* of Animals, thence to get Remedies for Diſeaſes, after the Example of *Rulandus* the famous *Phyſician* of *Ratisbonne*, who made a particular *Pharmacopæia*, wherein all the Compoſitions are different preparations of *Excrements*.

III. *A Letter of Dr* Wallis *to Captain* Edmund Halley; *concerning the Captains* Map *of* Magnetick Variations; *and ſome other things relating to the* Magnet.

Oxford, *May* 23. 1702.

SIR,

I Sent you a Letter about three weeks ſince, (which, I hope you received,) with my hearty Thanks for the Preſent you had then ſent me; your Map of the *Magnetick Variations.*

I look upon the thing as an Excellent Deſign, and very Inſtructive; well Contrived, and well Executed; And which, I think, was never undertaken by any, before you.

For a true Natural *Hiſtory* of matter of Fact, is certainly the ſureſt Foundation on which to ground a Phyſical *Hypotheſis*, to explain the *Cauſes*.

I am very well pleaſed to ſee, upon the whole, ſo promiſing a Proſpect, as (to me) this ſeems to be.

It fixeth the buſineſs of Magnetick Variation (in theſe Seas) for the *Preſent* Time. If like Obſervations had been made in former Ages, and tranſmitted to us, it would have been of great uſe. But it is now too late to wiſh for that.

If like Obſervations ſhall be made for the Future, from time to time, and Recorded; whereby it may appear, at what Rate the Variation Varies; it will afford a great In-ſight into the Magnetick Doctrine, of which we are ſo much in the dark.

I hope you intend to publiſh a *Diſcourſe*, in purſuance of that *Map*, which I ſhall be glad to ſee: Expecting to find, therein, divers conſiderable Remarks, by you obſerved in the Southern Seas; where (perhaps) never any had been, ſo far Southward, as you have been.

The Doctrine of the *Magnet*, hath been moſtly improved at *Greſham* College, (or by thoſe related thereunto, and there converſant,) for an Age or two laſt paſt; as *Blagrave*, *Gunter*, *Gellibrand*, *Gilbert*, *Norwood*, *Wright*, *Brigs*, *Foſter*, *&c.* and (of late) by *yourſelf*. If I have miſtaken ſome Names, or miſplaced them, or omitted others; you will be able to rectifie it.

I have given ſome Intimation of it (but very imperfectly) in a Letter of mine, inſerted in the *Tranſactions* for the Month of *December* 1701. where (beſide divers Literal Faults) they have unhappily miſ-printed 1635, inſtead of 1625.

For it was about the beginning of the Reign of King *Charles* the Firſt, that Mr *Gellibrand* (if I have not been miſ-informed) cauſed the Great *Concave Dial* to be erected in the *Privy Garden* at *White-hall*, (which, I think, is yet remaining;) with great care to fix a true *Meridian-Line*; and with a large *Magnetick Needle*, ſhewing its *Variation*, from that *Meridian*, from time to time.

I think it were not amiſs, if exact Obſervation were now made, whether the *Meridian* be, Now, juſt the ſame as it was Then. For it is very poſſible, that the *Pole* of the Earth, may, in time, ſuffer ſome little Variation (which may not readily be diſcerned,) which may cauſe an Alteration of the Meridian-Line. And this, if ſo, will be more diſcernible Nearer the Pole, than Farther off.

And though ſuch Proviſion (as was but now ſaid) were made at *White-hall*, for obſerving the Needles Variation from the true North; and, though (no doubt) notice have been given many times (there and elſewhere) what the Variation hath been at ſuch times: Yet, I doubt, no

Re-

Regiſter hath been kept of ſuch Obſervations; whence we might form a Scheme, how ſuch Variations do proceed from time to time.

It hath been obſerved alſo, of what they call the *Dipping Needle*; that, (beſide the *Horizontal* Direction toward the North,) it hath alſo a Direction of *Altitude*, above and below the Horizon, if balanced on an Horizontal Axis: Pointing as it were with its Northern end (in our Climate) to ſome Point within the body of the Earth. Whether or no this Direction do Vary (from time to time) as doth that of its Horizontal Poſition Northward; I cannot tell: nor do I know, whether or no it hath been yet obſerved. Nor, whether or no the Southern End, in other parts of the World, do *Dip*; as the Northern End doth with us. All which things deſerve ſerious Conſideration.

I could wiſh, that you would take ſome pains, (for I know not who can do it better,) by yourſelf, or whom elſe you ſhall think fit to aſſociate, to collect, and give us a brief Hiſtory, of what hath been done in this kind, (how, when, and by whom;) and by what Steps the Doctrine of the *Magnet* hath been gradually promoted: For it is pity the Memory of it ſhould be loſt. And perhaps it may be the laſt Requeſt I may live to beg of you, (being now at the age of 86;) And it is for the Publick, and not for my ſelf.

Or, if it be too great a task for you to undertake at preſent, (who have your hands full of other weighty buſineſs;) I wiſh the Royal Society would ſeriouſly recommend it to the care of ſome other fit perſon, of their Members, who may be Able and Willing to undertake it: As a thing that would be welcome to the Inquiſitive World, would be an Honour to the *Nation*, to *Greſham-College* in particular; and, to the *Royal Society*.

I have (in the Letter above-mentioned) given my Conjecture, that the *Mariners Compaſs* (of ſuch prodigious uſe in Navigation) was Originally an *Engliſh* Invention.

Not only, becauſe *England* was, at that time, as famous for Navigation as any Nation that I know,(for the *Holland* Sea-trade was not then in Being, nor for a long time after.) But even from the Name of *Mariners Compaſs*, (for what, in *Latin*, is called *Circulus Nauticus.*) For the word *Compaſs*, is an ancient *Engliſh* word, for what we otherwiſe call (by a *French* name) a *Circle.*

And I am ſure that, within my Memory, (in the place where I was Born and Bred,) it was wont to be commonly ſo called, (however, of later times, the word *Circle* is more in uſe.) And, if we conſult *Minſhew's* Dictionary, we ſhall find, that he takes *Circle*, and *Compaſs*, indifferently to ſignifie the ſame with *Circulus.*

And hence it is that *Circinus*, is, in *Engliſh*, called *a Compaſs*, (or *a pair of Compaſſes*,) as being the Inſtrument by which we deſcribe *a Compaſs*, or Circle.

Now I do not know, that the word *Compaſs* then was, (or now is,) in any *other* language, ſo uſed for a Circle *indefinitely*, or for any *other* Circle than the *Circulus Nauticus.* But now, in all Languages, (*French*, *Italian*, *German*, *&c.*) the *Circulus Nauticus* hath the Name of *Compaſs*, (or ſomewhat analogous,) *compaſs*, *compaſſo*, *zee-kompas*, *&c.* Which *Name*, I gueſs, together with the *Art*, they borrowed from *England.*

I might urge the ſame, from another Name, *Boſſolo*, *Boſſola*, *&c.* For, as *Circulus Nauticus* is the Mariners *Compaſs*; ſo *Pyxis Nautica* is the Mariners *Box*, (for the Engliſh *Box* is from the Latin *Pyxis*;) And *Pyxidula* (as a Diminutive from *Pyxis*) muſt be *Boxel* (or ſome word like it,) which eaſily paſſeth into the French *Buxole*, *Bouſſole*; and the Italian *Boſſola*, *Bouſſola*, *Boſſola*; which all ſeem to be from the Engliſh *Boxel* (*Pyxidala*) *a little Box*; ſoftening the ſound of the letter *x* in *ſſ*; as in *Aleſſandro* for *Alexandro.*

All which, though it be not a direct Demonſtration (in the ſilence of Hiſtory ;) is at leaſt a Probable *Conjecture*, and a Plauſible *Pretence* to the Invention (till a better claim do appear.) For, in the caſe of *New Inventions*, when they come abroad, they commonly take their *Names*, from whence the Invention itſelf is taken.

And where Inventions creep in by degrees, it muſt not be thought ſtrange, if it be not eaſie to ſay, who is the *Firſt Inventer*.

In the preſent caſe; He who firſt obſerved (I know not by what Accident) that the *Magnet* hath a *Polarity*, or Inclination Northward, made the *Firſt Step* towards this Invention. This (I think) was at firſt wont to be ſhewed, by putting a Magnet into a little Boat, ſwimming on Water, when it was obſerved, that this Magnet would of it ſelf ſo ſteer this little Boat, as that a certain Point in the Magnet would (if not hindered) turn toward the North. Which Point was thereupon called the Magnets *North Pole*.

He that afterward obſerved, that this Verticity, or Polarity, was communicable to a piece of Iron or Steel, rubbed on a Magnet, added a further ſtep toward the buſineſs in hand.

And he who contrived a way to ſet a Needle or piece of Steel (ſo touched) on a ſharp Pin, ſo as (in the Air) to move Horizontally thereon, ſo as (of itſelf) to find out the North, and Point toward it, as (before) the Swimming Magnet (in its Boat) had done on the Water; had now diſcovered a New Experiment, in Natural Philoſophy, very ſurprizing.

But this cannot yet be called *Circulus Nauticus* (or the *Mariners Compaſs*,) till they had further contrived a way, how to put a Needle (thus poiſed) into a Box, with a Compaſs or Circle round it; ſo divided as to denote the Azimuthal Points of the Horizon, (or, as they be now called, the *Points of the Compaſs*;) and ſo commodiouſly to fix this Box (ſo prepared) to the Ship, as thereby to inſtruct the Mariner (or Steers man) toward what Point of the Compaſs the Ship moved; that (by the help of the Rudder) he might put it into ſuch a courſe, as was proper for his Voyage. And it was now indeed *Pyxis Nautica* or *Circulus Nauticus*, (the *Mariners Box* or *Compaſs*,) but not till Then. And he who firſt contrived this Application, did *compleat* this Invention of *Circulus Nauticus*. But all thoſe antecedent Diſcoveries were ſteps towards it, and Parts of the Invention.

Now it is not likely, that all theſe Diſcoveries were made at once (by the ſame Man, at the ſame Time,) but Succeſſively ; by the joint Advice of divers Inquiſitive Men, and in a conſiderable tract of Time ; yet all perhaps of the ſame Nation, and (probably) the *Engliſh*.

But, whoever gave the firſt Hint of this Invention ; certain it is, that the great *Improvements* of the Magnetick Doctrine are due to the *Engliſh* ; and chiefly to thoſe about *London*, and *Greſham*-College. And it is fit the Memory of it ſhould be preſerved.

The Caſe is much the ſame with that of *Printing*, which we cannot reaſonably ſuppoſe to be invented all at once ; nor perhaps all by the ſame Man ; But rather, by the concurrent advice of divers, and in a conſiderable tract of time, before it come to that degree of Perfection, which we now call *Printing*.

It might be firſt obſerved, that the ſhape of a Letter, Figure or Picture, graved on Wood or Metal, might (with help of a convenient preparation of Oil, Ink, or coloured Liquor) be ſtamped on Paper. And, if once, then as oft as you pleaſe.

And, if by ſtamping the Print on Paper, then (as well) by due application of the Paper to the Print, thus prepared.

And, if one, then (by the ſame reaſon) to two or more (if fitly conjoined) and even to a whole Page at once ; and, of that, as many Copies as we pleaſe.

But (this being admitted) it remains further, to be contrived, how all theſe Prints or Stamps (for a whole Page) ſhall be ſo compoſed into one Frame, that the Paper may be applied to all at once.

It is then to be conſidered further, what kind of *Ink* (or ſomewhat inſtead of Ink) is to be applyed to the Face of the Letters thus compoſed. For common Writing-Ink will not ſerve the turn.

Then, How the Paper ſhall be applyed (with an Equal preſſure, and ſufficient) ſo as to take off juſt ſo much of that Ink, as repreſents the Face of thoſe Letters, and no more.

And, after all this, it muſt be further contrived, How to erect ſuch a Structure, as what we now call a *Printing-Preſs* : and, How to manage it, ſo as to anſwer all theſe Exigences. For, till all this be done, we are not arrived at what we call *Printing.* But all thoſe previous Contrivances, muſt be owned as *Parts* of the *Invention.*

And, in the *Magnetick Doctrine* likewiſe. And, to thoſe *previous* Diſcoveries, muſt be added, the *Subſequent* Improvements of Magnetick Knowledge, ſince the firſt *uſe* of the *Mariners Compaſs.* But of this enough.

I underſtand, you are engaged alſo in the buſineſs of the *Tides*, and the *Soundings* in our *Engliſh* Seas (and to very good purpoſe,) as well as the *Magnetick Variations.* Of which the one may poſſibly be ſubſervient to the other.

You may perhaps think fit, (in order thereunto,) to caſt your Eye on my Hypotheſis, *De Æſtu Maris.* Which, though a ſhort Eſſay, and publiſhed long ſince, (and but from a moderate knowledge of the Hiſtory of Tides;) contains (I think) much of Truth in it; and is capable of being Poliſhed, by thoſe who are better acquainted with the Hiſtory of Tides, than I pretend to be. For I look upon theſe *Hypotheſes* as highly probable, which do naturally follow from the general *Laws of Motion* duly conſidered. And I cannot but think, that, as well the *Courſe* and *Variation* of *Tides*; as the *Breezes* and *Trade-Winds* in ſeveral parts of the World; and the *Currents* on ſeveral Coaſts, with their *Annual Viciſſitudes* at ſeveral times of the year; do all depend, in great meaſure, on the *Earths Motion*, with that of the *Moon* (its Attendant,) and the *Compound Motion* of Both, with their *Common Center of Gravity.*

But I would not prejudge your ſpeculations; who may have reaſon to ſuſpect alſo ſome *Inteſtine* Motion within the Body of the Earth, of which we are not well aware.

SIR,

Yours to ſerve you,

John Wallis.

IV. *Methodus quadrandi genera quædam Curvarum, aut ad Curvas Simpliciores reducendi. per A. De Moivre R. S. S.*

SIT A Area Curvæ cujus Abſciſſa x, & ordinatim Applicata $x^m \sqrt{dx-xx}$. Sit B Area Curvæ cujus Abſciſſa eadem cum priori, ſed ordinatim Applicata $x^{m-n} \sqrt{dx-xx}$; ponatur $\sqrt{dx-xx} = y$. Erit Area $A =$

$$d^n B \text{ in } \frac{2m+1}{2m+4} \text{ in } \frac{2m-1}{2m+2} \text{ in } \frac{2m-3}{2m} \text{ in } \frac{2m-5}{2m-2} \text{ \&c,} = P$$

$$-\frac{1}{m+2} x^{m-1} y^3 = -Q$$

$$-\frac{d}{m+1} \text{ in } \frac{2m+1}{2m+4} x^{m-2} y^3 = -R$$

$$-\frac{dd}{m} \text{ in } \frac{2m+1}{2m+4} \text{ in } \frac{2m-1}{2m+2} x^{m-3} y^3 = -S$$

$$-\frac{d^3}{m-1} \text{ in } \frac{2m+1}{2m+4} \text{ in } \frac{2m-1}{2m+2} \text{ in } \frac{2m-3}{2m} x^{m-4} y^3 = -T$$

&c.

Ubi notandum 1° quod n Supponitur numerus integer & affirmativus; 2° Quod Quantitas $d^n B$ in ſerie per P deſignata, multiplicari debet in tot terminos quot ſunt unitates in n; 3° quod tot ſequentes ſeries per $-Q$, $-R$, $-S$, $-T$ &c. deſignatæ ſumi debeant, quot ſunt unitates in n; quod ut

Exemplo uno vel altero clarius fiat, dico quod ſi $n = 1$, tunc A

$$= d^n B \text{ in } \frac{2m+1}{2m+4} - \frac{1}{m+2} x^{m-1} y^3$$ & ſi $n = 2$,

$$A = d^n B \text{ in } \frac{2m+1}{2m+4} \text{ in } \frac{2m-2}{2m+2} - \frac{1}{m+2} x^{m-1} y^3$$

$$- \frac{d}{m+1} \text{ in } \frac{2m+1}{2m+4} \text{ in } x^{m-2} y^3$$

4° quod ſi y ponatur $= \sqrt{dx-xx}$, tunc A erit $= Q - R + S - T$ &c. $\pm P$.

Corollarium.

Si m ponatur æqualis termino cuivis ſequentis Seriei

$$-\frac{1}{2}, \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \frac{9}{2} \text{ \&c.}$$

quadratura Curvæ cujus ordinatim Applicata $x^m \sqrt{dx-xx}$, aut $x^m \sqrt{dx+xx}$ finita evadit & exhibetur per ſeriem noſtram; quod ut Exemplo illuſtretur, Inquirenda ſit Area Curvæ cujus ordinatim Applicata $x^{-\frac{1}{2}} \sqrt{dx-xx}$; fingatur Curvam hanc comparari cum Curva cujus ordinatim Applicata $x^{-\frac{3}{2}} \sqrt{dx-xx}$, quoniam hoc in caſu $n = 1$, ideo

$$A = d^n B \text{ in } \frac{2m+1}{2m+4} - \frac{1}{m+2} x^{m-1} y^3$$

ſed $m = -\frac{1}{2}$, ergo $2m+1 = 0$, ideoq;

$$A = -\frac{1}{m+2} x^{m-1} y^3 = -\frac{2y^3}{3\sqrt{x^3}}$$

Hic Obſervatu dignum eſt quod Area ſic reperta interdum data quantitate deficit a vera Area, aut eandem data quantitate excedit; quo autem exceſſus iſte aut defectus innoteſcat, ſupponatur Area reperta augeri minuive data quantitate q, tuncque poſita $x=0$, ſupponatur Area aucta minutave æqualis nihilo, ſic in præſenti caſu q reperietur $=\frac{2}{3}d\sqrt{d}$, adeoq;

$$A=\frac{2}{3}d\sqrt{d}\quad\frac{2y^{3}}{3\sqrt{x^{3}}}$$

Corollarium $2^{dum.}$

Si n ponatur æqualis termino cuivis ſequentis ſeriei 3, 4, 5, 6, 7, &c. Quadratura Curvæ cujus ordinatim applicata $x^{-n}\sqrt{dx-xx}$ aut $x^{-n}\sqrt{dx+xx}$, finita evadit, & exhibetur per ſeriem noſtram; Inquirenda ſit Area Curvæ cujus ordinatim applicata $x^{-3}\sqrt{dx-xx}$. finge eam comparari cum Area Circuli, quæ vocetur A; erit $m=0$, $n=3$, adeoq; $A=P-Q-R-S$. Sed cum quantitas $2m$ infinite parva ſeu potius nulla, in Denominatore termini tertii per quem $d^{n}B$ multipicatur, extet, Quantitas deſignata per P infinita eſt; atque ob eandem cauſam, Quantitas deſignata per $-S$ infinita evadit, adeoque Quantitates A, $-Q$, $-R$ evaneſcunt: Igitur $P=S$, diviſaque æquatione per $\frac{2m+1}{2m+4}$ in $\frac{2m-1}{2m+2}$ fit

$$d^{n}B \text{ in } \frac{2m-3}{2m}=\frac{dd}{m}x^{m-3}y^{3}\quad\text{ſeu } d\ B \text{ in } \frac{2m-3}{2}$$

$=dd\,x^{m-3}y^{3}$: ſcriptiſque 0 & 3 pro m & n prodibit

$$d\,B \text{ in } -\frac{3}{2} = \frac{y^3}{x^3}, \text{ ſeu } B = -\frac{2y^3}{3x^3},$$

Corollarium $3^{um.}$

Si m ponatur æqualis termino cuivis ſequentis ſeriei, — 2, — 1, 0, 1 2, 3, 4, 5, &c. quadratura Curvæ cujus ordinata $x^m \sqrt{dx-xx}$, pendet a quadratura Circuli: Area vero Curvæ cujus ordinata $x^m \sqrt{dx+xx}$ pendet a quadratura Hyperbolæ, & relatio iſtius Curvæ cum Circulo aut Hyperbola exhibebetur per Seriem noſtram in terminis finitis.

Corollarium $4^{um.}$

Si m exponatur per alium quemvis terminum differentem ab iis quas ſupra memoravimus, Curva cujus ordinata $x^m \sqrt{dx-xx}$ aut $x^m \sqrt{dx+xx}$, neque quadratur exacte, nec ab Hyperbola aut Circulo pendet, ſed ad Curvam ſimpliciorem reducitur per ſeriem noſtram.

Theorema $2^{um.}$

Sit A Area Curvæ cujus Abſciſſa x & ordinatim applicata $\frac{x^m}{\sqrt{dx-xx}}$ Sit B area Curvæ cujus Abſciſſa eadem cum priori ſed ordinatim applicata $\frac{x^{m-n}}{\sqrt{dx-xx}}$ ponatur $\sqrt{dx-xx} = y$. Erit $A =$

$d\,B$

$$d^n B \text{ in } \frac{2m-1}{2m} \text{ in } \frac{2m-3}{2m-2} \text{ in } \frac{2m-5}{2m-4} \text{ in } \frac{2m-7}{2m-6} \text{ \&c.} = P.$$

$$-\frac{1}{m} x^{m-1} y = -Q.$$

$$-\frac{d}{m-1} \text{ in } \frac{2m-1}{2m} x^{m-2} y = -R$$

$$-\frac{dd}{m-2} \text{ in } \frac{2m-1}{2m} \text{ in } \frac{2m-3}{2m-2} x^{m-3} y = -S$$

$$-\frac{d^3}{m-3} \text{ in } \frac{2m-1}{2m} \text{ in } \frac{2m-3}{2m-2} \text{ in } \frac{2m-5}{2m-4} x^{m-4} y = -T$$

&c.

Obſervationes ad primum Theorema, hic & in ſequentibus locum habent.

Corollarium 1$^{um.}$

Si m ponatur æqualis Termino cuivis ſequentis ſeriei, $\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \frac{9}{2}$, &c. quadratura Curvæ cujus ordinatim applicata $\frac{x^m}{\sqrt{d\,\overline{x-xx}}}$ aut $\frac{x^m}{\sqrt{d\,\overline{x+xx}}}$ finita evadit, & exhibetur per hanc ſeriem.

Co-

Corollarium $2^{um.}$

Si *n* ponatur æqualis Termino cuivis ſequentis ſeriei 1, 2, 3, 4, 5, 6, 7, &c. Curva omnis cujus ordinatim applicata $\frac{x^{-n}}{\sqrt{dx-xx}}$ aut $\frac{x^{-n}}{\sqrt{dx+xx}}$ quadratur per hanc ſeriem in terminis finitis.

Corollarium $3^{um.}$

Si *m* exponatur per terminum quemlibet ſequentis ſeriei, 0, 1, 2, 3, 4, 5, 6, 7, &c. Curva cujus ordinatim applicata $\frac{x^{m}}{\sqrt{dx-xx}}$ pendet a Quadratura Circuli. Curva vero cujus ordinatim applicata $\frac{x^{m}}{\sqrt{dx+xx}}$, a quadratura Hyperbolæ. Etenim ſi Centro *C*, Diametro $AB = d$ deſcribatur Circulus *A E B*, ac ſumatur $AD = x$; erecto *D E* normaliter, junge *C E*. Sector *A E C* per $\frac{1}{8}dd$ diviſus æqualis eſt Areæ Curvæ cujus Ordinata $\frac{x^{0}}{\sqrt{dx-xx}}$ Eodem modo, ſi Centro C, Tranſverſo axi $AB = d$, deſcribatur æquilatera Hyperbola *A E*, ſumatur $AD = x$, erigatur *D E* ad angulos rectos, jungatur *C E*; ſector *A C E* per $\frac{1}{8}dd$ diviſus æqualis eſt Areæ Curvæ cujus ordinata $\frac{x^{0}}{\sqrt{dx+xx}}$

Corollorium 4$^{um.}$

Si *m* ponatur æqualis Termino cuivis, qui non in limitationes præcedentes cadat, Curva cujus ordinata $\frac{x^m}{\sqrt{dx+xx}}$ neque quadratur exacte,, nec a Circulo aut Hyperbola pendet, ſed ad Curvam ſimpliciorem reducitur.

Theorema 3$^{um.}$

Sit *A* Area Curvæ cujus Abſciſſa *x*, ordinatim applicata $x^m \sqrt{rr-xx}$, ſit *B* area Curvæ cujus Abſciſſa itidem *x*, ordinatim applicata $x^{m-2n} \sqrt{rr-xx}$, ponatur $\sqrt{rr-xx}=y$. Erit. $A=$

$$r^{2n} B \text{ in } \frac{m-1}{m+2} \text{ in } \frac{m-3}{m} \text{ in } \frac{m-5}{m-2} \text{ in } \frac{m-7}{m-4} \text{ \&c.} = P.$$

$$-\frac{1}{m+2} x^{m-1} y^3 = -Q$$

$$-\frac{rr}{m} \text{ in } \frac{m-1}{m+2} x^{m-3} y^3 = -R$$

$$-\frac{r^4}{m-2} \text{ in } \frac{m-2}{m+2} \text{ in } \frac{m-3}{m} x^{m-5} y^3 = -S.$$

&c.

Corollarium 1$^{um.}$

Si *m* exponatur per terminum quemvis ſequentis ſeriei 1, 3, 5, 7 9, &c. Quadratura Curvæ cujus ordinata $x^m \sqrt{rr-xx}$ aut $x^m \sqrt{rr+xx}$ finita evadit, & exhibetur per hoc Theorema.

Corol-

Corollarium 2^{um.}

Si n exponatur per terminum quemvis ſequentis ſeriei 2, 3, 4, 5, 6, &c. Curva cujus ordinata $x^{-2n}\sqrt{rr-xx}$ aut $x^{-2n}\sqrt{rr+xx}$, quadratur exacte per hoc Theorema.

Corollarium 3^{um.}

Si m exponatur per Terminum quemvis ſequentis ſeriei -2, 0, 2, 4, 6, 8, &c. Quadratura Curvæ cujus ordinata $x^{m}\sqrt{rr-xx}$, pendet a Circulo. Quadratura vero Curvæ cujus ordinata $x^{m}\sqrt{rr+xx}$, pendet ab Hyperbola.

Corollarium 4^{um.}

Si m exponatur per Terminum quemvis differentem ab illis quos ſupra memoravimus, Curva cujus ordinata $x^{m}\sqrt{rr-xx}$, aut $x^{m}\sqrt{rr+xx}$, neque exacte quadratur, nec a Circulo aut Hyperbola pendet, ſed ad ſimpliciorem Curvam reducitur.

Theorema 4^{um.}

Sit A Area Curvæ cujus abſciſſa x, ordinatim applicata $\frac{x^{m}}{\sqrt{rr-xx}}$, Sit B Area Curvæ cujus Abſciſſa itidem x, Ordinatim applicata $\frac{x^{m-2n}}{\sqrt{rr-xx}}$ Erit $A =$

$$r^{2n} B \text{ in } \frac{m-1}{m} \text{ in } \frac{m-3}{m-2} \text{ in } \frac{m-5}{m-4} \text{ in } \frac{m-7}{m-6} \text{ \&c.} = P.$$

$$-\frac{1}{m} x^{m-1} y = -Q$$

$$-\frac{rr}{m-2} \text{ in } \frac{m-1}{m} x^{m-3} y = -R$$

$$-\frac{r^4}{m-4} \text{ in } \frac{m-1}{m} \text{ in } \frac{m-3}{m-2} x^{m-5} y = -S$$

$$-\frac{r^6}{m-6} \text{ in } \frac{m-1}{m} \text{ in } \frac{m-3}{m-2} \text{ in } \frac{m-5}{m-4} x^{m-7} y = -T.$$

&c.

Corollarium 1$^{um.}$

Si m exponatur per terminum quemvis ſequentis ſeriei 1, 3, 5, 7, 9, &c. Quadratura Curvæ cujus ordinata $\frac{x^m}{\sqrt{rr-xx}}$ aut $\frac{x^m}{\sqrt{rr+xx}}$, per hoc Theorema habetur in finitis Terminis

Corollarium 2$^{um.}$

Si n exponatur per terminum quemlibet ſequentis ſeriei 1, 2 3, 4, 5, 6, &c. Curva cujus ordinatim applicata $\frac{x^{-2n}}{\sqrt{rr-xx}}$ aut $\frac{x^{-2n}}{\sqrt{rr+xx}}$ exacte quadratur per hoc Theorema

Corollarium $3^{um.}$

Si *m* exponatur per terminum quemvis ſequentis ſeriei 0, 2, 4, 6, 8, 10, &c. Quadratura Curvæ, cujus ordinatim applicata $\frac{x}{\sqrt{rr-xx}}$ pendet a quadratura Circuli. Etenim ſi Centro *C* radio $CA = r$ deſcribatur Circulus *A E G*, ſumatur $CD = x$, erigatur *D E* normalis ad *C D*, Jungatur *C E*: Sector *C A E* per $\frac{1}{2}$ *rr* diviſus æqualis eſt Areæ Curvæ cujus ordinatim applicata $\frac{x^0}{\sqrt{rr-xx}}$. Eodem modo ſi Centro *C*, Tranſverſo ſamiaxi $CA = r$, deſcribatur æqualatera Hyperbola *E A M*, ducatur *C F* ad *A G* perpendicularis $= x$, ducatur *F E* axi parallela donec occurrat Hyperbolæ in *E*, jungatur *C E*: ſector Hyperbolicus *A C E* per $\frac{1}{2}$ *rr* diviſus æqualis eſt Areæ Curvæ cujus ordinatim applicata $\frac{x^0}{\sqrt{rr+xx}}$

Corollarium $4^{um.}$

Si *m* exponatur per terminum quemlibet a præcedentibus differentem, Curva cujus ordinata $\frac{x^m}{\sqrt{rr-xx}}$ aut $\frac{x^m}{\sqrt{rr+xx}}$ neque quadratur exacte, nec a Circulo aut Hyperbola pendet, ſed ad Curvam ſimpliciorem reducitur,

Theo-

Theorema 5$^{um.}$

Sit A Area Curvæ cujus abſciſſa x, ordinatim applicata $\frac{x^m}{d-x}$; ſit B Area Curvæ cujus abſciſſa itidem x, ejuſq; ordinatim applicata $\frac{x^{\overline{m-n}}}{d-x}$ Erit Area

$$A = d^n B - \frac{x^m}{m} - \frac{d x^{\overline{m-1}}}{m-1} - \frac{dd x^{\overline{m-2}}}{m-2} \text{ \&c.}$$

Sit ordinatim applicata $\frac{x^m}{d+x}$, tunc Area erit $=$

$$A = \frac{x^m}{m} - \frac{d x^{\overline{m-1}}}{m-1} + \frac{dd x^{\overline{m-2}}}{m-2} \text{ \&c. } \pm d^n B.$$

Corollarium.

Si m exponatur per terminum quemlibet ſequentis ſeriei, 0, 1, 2, 3, 4, 5, 6, &c. Quadratura Curvæ cujus ordinatim applicata $\frac{x^m}{d-x}$, aut $\frac{x^m}{d+x}$ pendet a quadratura Hyperbolæ;

Vide Fig. 3.

Etenim ductis DE, EF ad angulos rectos, ſumatur $EG = d$, ducatur GH normalis ad EF & ipſi æqualis. Intra Aſymptotos DE, EF deſcribatur Hyperbola per H tranſiens, quo facto ſumatur $GK = x$ verſus E pro primo caſu, at verſus F pro ſecundo; ducatur ordinatim applicata KL: Area $HGKL$ per dd diviſa æqualis eſt Areæ Curvæ cujus ordinatim applica-

$\frac{x^0}{d-x}$ aut $\frac{x^0}{d+x}$. Hinc Solidum generatum a portione Ciſſoidis dum circa Diametrum circuli genitoris revolvit, in finitis terminis exhibetur, data Hyperbolæ Quadratura.

Theorema $6^{um.}$

Sit A Area Curvæ cujus abſciſſa x, ordinatim applicata $\frac{x^m}{rr+xx}$; Sit B Area Curvæ cujus abſciſſa itidem x, ordinatim applicata $\frac{x^{m-2n}}{rr+xx}$, Erit Area

$$A = \frac{x^{m-1}}{m-1} - \frac{rr\,x^{m-3}}{m-3} + \frac{r^4\,x^{m-5}}{m-5} - \&c. \mp r^{2n}B.$$

Corollarium

Si m exponatur per terminum quemlibet ſequentis ſeriei 0, 2, 4, 6, 8, &c. Quadratura Curvæ cujus ordinatim applicata $\frac{x^m}{rr+xx}$ pendet a rectificatione circularis Arcus. Etenim ſi centro C radio $CA=r$ deſcribatur Circulus AEG, ducatur Tangens $AK=x$ jungatur CK peripheriæ occurrens in E; arcus AE per rr diviſus æqualis eſt Areæ curvæ cujus ordinata

$$\frac{x^0}{rr+xx}$$

Corol-

Corollarium generale ad hæc ſex Theoremata.

Curva omnis mechanica cujus quadratura pendet ab aliqua ə Curvis numero infinitis, cujus ordinatæ formas ſequentes adipiſci poſſunt $x^m\sqrt{dx \pm xx}$, $\frac{x^m}{\sqrt{dx \pm xx}}$; $x^m\sqrt{rr \pm xx}$ $\frac{x^m}{\sqrt{rr \pm xx}}$ $\frac{x^m}{d \pm x}$, $\frac{x^m}{rr + xx}$, per ſeries has quadrari poteſt. Hoc Exemplo unico indicare ſatis erit.

Poſito quod Cubus Arcus Circularis Sinui verſo correſpondentis fiat Ordinata Curvæ, cujus Abſciſſa ſit idem Sinus verſus. Inquirenda eſt Area iſtius Curvæ.

Sit Abſciſſa x, arcus circularis v, fluxio Areæ ſit $v^3\dot{x}$,

Sit Area $v^3x - q$. Igitur $v^3\dot{x} + 3v^2\dot{v}x - \dot{q} = v^3\dot{x}$, unde $\dot{q} = 3v^2\dot{v}x$; ſed $\dot{v} = \frac{d\dot{x}}{2\sqrt{dx-xx}}$, igitur $\dot{q} = \frac{3dv^2x\dot{x}}{2\sqrt{dx-xx}}$, ſed per Theorema II. $\frac{x\dot{x}}{\sqrt{dx-xx}} = \frac{d\dot{x}}{2\sqrt{dx-xx}} - \dot{y} = \dot{v} - \dot{y}$, adeoq; $\dot{q} = \frac{3}{2}dv^2\dot{v} - \frac{3}{2}dv^2\dot{y}$, igitur $q = \frac{1}{2}dv^3 - \int\frac{3}{2}dv^2\dot{y}$.

Ergo ad hoc perventum eſt ut fluentem quantitatem inveniamus cujus fluxio eſt $\frac{3}{2}dv^2\dot{y}$.

Sit hæc quantitas $\frac{3}{2}dv^2y - r$.

Igitur $\frac{3}{2}dv^2\dot{y} + 3dv\dot{v}y - \dot{r} = \frac{3}{2}dv^2\dot{y}$.

Adeoque $\dot{r} = 3dv\dot{v}y = \frac{3}{2}ddv\dot{x}$ Sit $r = \frac{3}{2}ddvx - s$.

Igitur $\frac{3}{2}ddv\dot{x} = \frac{3}{2}ddv\dot{x} + \frac{3}{2}ddx\dot{v} - \dot{s}$.

adeoque. $\dot{s} = \frac{3}{2}ddx\dot{v} = \frac{3d^3x\dot{x}}{4\sqrt{dx-xx}} = \frac{3}{4}d^3\dot{v} - \frac{3}{4}d^3\dot{y}$, per 2$^{um.}$ Theorema.

Igitur $s = \frac{3}{4} d^3 v - \frac{3}{4} d^3 y.$ adeoque area quæſita $=$ $v^3 x - \frac{1}{2} d v^3 + \frac{3}{2} d v^2 y - \frac{3}{2} d d v x + \frac{3}{4} d^3 v. - \frac{3}{4} d^3 y.$

Quoniam autem Solida ex rotatione Curvarum genita, Superficies ab eadem rotatione genitæ, Longitudines Curvarum, & Centra Gravitatis horum omnium a Quadratura Curvarum pendent, hæc ſi a Curvis ſupradictis pendent facillime computantur.

Poſtquam Theoremata hæc concinnaveram, eaque Clariſſimo *Newtono*, ut ſupremo harum rerum Judici, monſtraveram; obtulit ille mihi Chartas ſuas manuſcriptas, quibus mihi conſtat ſe diu compotem fuiſſe methodi qua, æquatione Trinomiali quavis data naturam Curvæ exprimente, illa Curva aut quadratur aut ad ſimpliciorem Curvam reducitur.

Optandum autem eſſet ut non ſolum ea quæ ad hanc rem ſpectant, ſed alia multa præclara ejus inventa publici juris facere dignaretur. Hoc credo univerſæ Reipublicæ Literariæ votum eſſe.

Nullus dubito Doctiſſimos viros quorum ſcripta in actis eruditorum alibique tam valde Mathematicas diſciplinas promoverunt, methodos huic noſtræ affines habere; adeoque nihil in his mihi aſcribendum puto niſi quod Theoremata hæc reperierim, neſcius an ullibi extarent; eaque ad formam tam facilem reduxerim, ut calculus omnis ad hanc materiam ſpectans uno quaſi intuitu conficiatur. Priuſquam ſcribendi finem facio, non abs re futurum eſſe arbitror, ſi nunc, nulla data citius occaſione, pauca quædam repoſuerim Clariſſimi *Leibnitii* animadverſionibus, ad Seriem quandam a me publicatam de radice infinitæ æquationis invenienda. Exiſtimat Vir Clar. Seriem illam non ſatis generalem eſſe, utpote non attingentem caſus ubi quantitates z & y in ſe invicem ducuntur; adeoque ſeriem aliam pro mea ſubſtituit, hancq; aſſerit mea infinite generaliorem: illum autem in levem hunc errorem inductum eſſe ſuſpicor, quod quantitates a, b, c, d, &c. pro quantitatibus datis aſſumpſerit, cum pro quantitatibus datis aut indeterminatis indiſcriminatim uſurpandæ fuerint. Sed exemplum unum afferre libet, quo pateat ſeriem noſtram caſus omnes pervadere; ſit Æquatio $nyz - z^3 = y^3$ In Theoremate noſtro fiat $a = ny$, $b = 0$, $c = -1$, $g = 0$, $h = 0$, $i = 1$, aut melius fiat

$g = yy$

$g = yy$, $h = 0$, $i = 0$. in utroque caſu fiet $Z =$

$$Z = \frac{yy}{n} + \frac{y^5}{n^4} + \frac{3y^8}{n^7} + \frac{12y^{11}}{n^{10}} \ \&c.$$

V.

An Account of the Appearance of ſeveral Unuſual Parhelia, *or* Mock-Suns, *together with ſeveral Circular Arches lately ſeen in the Air by* E: Halley.

ON the Eighth of *April*, this preſent Year, 1702, walking in *London* Streets about ten in the Morning, the Air being clear, I obſerved the Sun to ſhine faintly, or as we call it, wateriſh; whereupon caſting up my Eye, I perceived ſeveral Arches of Circles about him. I made what haſt I could to get on the top of a Houſe, which I did at Mr. *Mordens* by the Royal *Exchange*, and found the Appearance as is deſcribed in Figure 4. *Tab.* 3° wherein

S is the true Sun, *Z* the Zenith.

S T P P a great white Circle paſſing through the Sun, and as near as I could judge, parallel to the Horizon. It was very diſtinct and entire, about two Degrees broad in the *Northern* part about *T*; and held much the ſame breadth in the *Eaſt* and *Weſt*, but grew narrower towards the Sun, its edges were not very well defined, the whole appearing like a faint white Cloud, and a part of it would have been taken for ſuch, but the whole Circle ſeen in the pure Azure Sky was a very ſurprizing ſight.

V N X Y a *Halo*, or rather *Iris*, that was likewiſe an intire Circle, having the Sun for its Center. I meaſured the Semidiameter of this to be much about 22 Degrees: the breath of this Arch which was well defined, was by eſtimate equal to the Suns Diameter, and it was coloured with the Colours of the *Iris*, but nothing near ſo *vivid* as in the common Rainbow. The *Reds* were next the Sun, and the *Blews* in the outward Limb. Within this Circle the Sky appeared ſomewhat obſcure, eſpecially near the Arch; and I take it, that the cauſe of that Obſcurity was likewiſe cauſe that the Sun ſhone ſo faint and wateriſh. I expected two *Parhelia* at *X* and *Y* in the Interſections of this with the white Circle, having often ſeen them at that diſtance and poſition from the true *Sun*, but at this time none ſuch appeared.

P V P. an arch of another Circle, of which only the upper part appeared, it was in all reſpects, both for breadth and Colours like the Circle *V N X Y* which it touched in the Vertical Point *V*, but its Center was below at *N*, or near it. In the Interſections of this Arch with the white Circle on both ſides were two very bright *Parhelia*, ſo luminous, that I do not remember to have ſeen the like, which were alſo tinged with Colours, eſpecially on the ſide next the Sun, where they were very red. I meaſured their diſtance from the true Sun, and found it 31½ Degrees. About *V* where the two Arches were conicident, it was very bright likewiſe, and the *Red* on the inſide very ſtrong, that ſome might have imagined another Sun there alſo, but the *Species* thereof was drawn out ſo in length, that it could not properly be called a *Parhelion*: This Arch *P V P* broke off on both ſides, about five or ſix Degrees below the *Parhelia P. P.*

At *N*, or the lower part of the Circle *V N X Y*, there appeared likewiſe a ſmall piece of an Arch, which touched it there, after the ſame manner as *P V P* touched in *V*; it ſeemed to have its Center in *V*, and about *N* there appeared another longiſh red *Species*, ſuch as at *V*, but not altogether ſo bright.

The height of the Sun, during the Obſervation, was from 40 to 45 Degrees, when Clouds interpoſing, no more was to be ſeen; the Weather was cooler than ordinary, with a gentle *N W* Wind. And it was plain that the Vapour which cauſed this Appearance, was higher than the Clouds, for they were ſeen to drive under the Circles.

VI. *Part of ſome Letters from Mr* Chriſtopher Hunter *to Dr* Martin Liſter, *F. R. S. concerning ſeveral* Roman *Inſcriptions, and other Antiquities in* Yorkſhire.

Stockton, Apr. 12. 1702.

SIR,

I Humbly beg pardon for ſo long delaying to abſolve the Promiſe I formerly made of preſenting you with an account of another *Roman* Station in the County of *Durham*, at a Village call'd *Ebcheſter*: but tho I was born near that place, and ſince my promiſe have often carefully view'd it, I cou'd not till very lately ſatisfie my ſelf ſo far as to be able to reduce my mind from the vulgar opinion, that this has never been more than a Place nam'd from that Pious Virgin St *Ebba*, which is all Mr *Cambden* ſays of it.

It has been ſurrounded with a Wall of hewn Stone, and ſeems to have been an exact ſquare of about 200 yards on every ſide: here have been Suburbs towards the Weſt, South, and perhaps Eaſt, of a conſiderable extent: but towards the North the Wall has ſtood upon the top of a ſteep bank, under which runs the River *Derwent*, in which not long ſince was found a long Altar, but its Inſcription is defaced: as alſo a leſſer Stone, with this word HAVE, not on the front, but on one ſide; this Stone is in my poſſeſſion. There is another (which is uſed as a Grave-ſtone) it lies before the Church-door, which by the Engraving of a Man from the Breaſt upwards in a *Roman* dreſs, ſeems to have been *Roman*. Theſe are all the Stones I can meet with that have ever had any *Roman* Inſcription. I enquired of the moſt underſtanding Inhabitants concerning what has been found there whilſt they digg'd up the Ruins of this place; all confeſs they have dug up many Inſcriptions, but (becauſe no body there underſtood them) they always broke them: and they add, that in moſt places they plainly diſcern two different foundations of ruin'd Houſes, and moſt Stones thus dug up are ting'd of a deep red colour, undoubtedly by Fire. That part of the Village which ſtands within the Walls is call'd the *Mains*, and there are the moſt ruins: here are many Tiles dug up of a red Clay, but not one entire.

About twenty years ago, ſome out of a Project of finding a Treaſure, and prompted forward by the Tradition of an Iron Gate, ſuppoſed to be about eighty yards from the place where they made the firſt attempt, began to nndermine an old Foundation ſtill viſible on a Hill ſide, and after they made a ſmall progreſs found a conſiderable quantity of a melted Metal, which at firſt view they ſuppoſed had been Silver, but upon a ſecond examination it proved to be no more than Pewter, which diſcouraged the Undertakers ſo much that they deſiſted from further Enquiry.

Watlingſtreet paſſes by this Place about a hundred yards to the Weſt: for it could not conveniently be brought through the Town without a tenfold charge, by reaſon of a Brook two or three hundred yards to the South, whoſe Banks are not a little uneven, and the above mention'd ſteep Hill towards the North makes a Paſſage that way next to impoſſible.

I can meet with no certainty whether the *Romans* have had a Bridge over *Derwent* at *Ebcheſter*, ſo dare determine nothing as to that point; but the Affirmative ſeems to me more reaſonable, both from the number of Souldiers who muſt needs have paſſed that way, as alſo from the conſiderable largeneſs of this River.

The Paſſage in the Second Book of *Ptolomy*'s Geography, *Sub Elgovis & Olludinis ad utraq; Maria habitant Brigantes in quibus Urbes Epiacum, Vinnovium, Caturactonium; Calatum, Iſurium, Rhigodunum, Olicana, Eboracum*, ſeems to perſwade me that this may probably have been *Epiacum* of the *Romans*, eſpecially if it can be granted that this Author mentions only the Places in the Eaſtern Parts of this Province (and only *Epiacum*, if placed at *Papcaſtle*, and *Rhigodunum*, if at *Ribcheſter*, thwart this aſſertion.) And indeed I am apt to believe that *Ptolomy* begins his Enumeration of the Places among the *Brigantes* at the Place neareſt *Hadrian*'s Wall, and has advanced in order (tho with ſome Omiſſions) to *Eboracum*, the chief Town in the Province: And further, the Modern name *Ebcheſter* agrees as well with *Epiacum* as *Papcaſtle* does, for all know the Mutation of P into B to be a thing not unuſual. I hope this Conjecture will not be oppoſite to the Authority of other Writers, whom I'm ſorry I have not a convenience to conſult upon this Point.

To morrow I intend to go view ſome more Stones which I lately had an account of; if there be any Inſcriptions of value, I'll let you know the firſt opportunity. I am

SIR,

Your moſt Obliged Servant,

Chris. Hunter.

SIR,

I Had acquainted you with the ſucceſs of my Journey before this time if the expectation of an Anſwer to that Letter I made bold to write to you ſome weeks ſince about a *Roman* ſtation in this County, had not put a ſtop to my Reſolutions.

Thoſe Inſcriptions, I doubt not, will find a favourable reception; tho, 'tis to be confeſs'd, ſome of them are not ſo perfect as I could have deſired: and moſt of the words in that mark'd Tab. 1. No 1. are ſo artificially erazed, that I am apt to believe it has been thus defaced upon ſome Revolution in the *Roman* Government. This, (with ſeveral more, beautify'd with Inſcriptions and Engraving, but which are now taken away) was dug up ſome time ago in a Field called the *Bower*, it is about half way between the *Roman* Wall and South *Tine*, and is near two miles Weſt from *Buſie gap*; here has been a *Roman* Garriſon kept, it has been ſurrounded with a ſingle Wall, and is ſquare; 'tis nothing now but heaps of Stones, overgrown with Buſhes.

Some years ago, on the Weſt ſide of this Place, about fifty yards from the Walls thereof, there was diſcover'd under a heap of Rubbiſh a ſquare Room ſtrongly vaulted above, and paved with large ſquare Stones ſet in Lime; and under this a lower Room, whoſe Roof was ſupported by rows of ſquare Pillars of about half a yard high: the upper Room had two niches, like (and perhaps in the nature of) Chimneys on each ſide of every corner or ſquare, which in all made the number ſixteen; the Pavement of this Room, as alſo its Roof, were tinged black with Smoak. The Stones uſed in Vaulting the upper Room have been marked as our Joyners do the Deals for Chambers; thoſe I ſaw were number'd thus, X. XI. XIII. The man who farms this ground preſented me with a winged Image, it has been about three Inches long, but now wants the Head and Feet.

The other Inſcriptions were all found near the *Houſeſteads*, a Place ſo called from the abundance of Ruins; this is about half a mile from *Buſy-gap* towards the Weſt, and is placed juſt within the *Roman* Wall; among the Ruins I found ſeveral Pedeſtals, two or three Pillars, two Images, but ſomewhat defaced. The Stone Tab. 1. No 2. lies againſt a Hedge a quarter of a mile from this place. That marked Tab. 1. No 3. tho only part of an Altar, I thought worthy tranſcribing, becauſe I am in hopes of recovering the other part as ſoon as Harveſt is over, this part having been tore up by the Plough. The two Altars Tab. 1. No 4. and 5. are very legible; I found them on a riſing ground South of the *Houſeſteads*; they call it *Chapel hill*, and ſuppoſe a Foundation, which is viſible there, to have been a Chapel; and ſay that within the memory of their Fathers they uſed to bury their dead here: I dare not determine in this point.

I wiſh heartily any thing worth notice may have occurr'd, and aſſure you that I will always endeavour (as much as buſineſs will permit) to furniſh you with ſuch things as ſeem worthy your acceptance. I am

SIR,

Your moſt humble Servant,

Stockton, *May* 15. 1702.

Chriſ. Hunter.

SIR,

I Have nothing ſo much worth returning as an account of my laſt Journey into *Northumberland* on the 18th and 19th of this inſtant. found *Watlingſtreet* very viſible from near *Ebcheſter* almoſt to *Corbridge*, which is about ſeven miles: here beyond expectation I met with this Altar markedTab.2. a.I drew both ſides of it,b. and c. as well as I could; On the top it is hollow at leaſt eight inches deep: the Inſcription is all legible except the ſecond and laſt letters in the firſt line, the ſecond and third in the third line, and the third in the laſt, which are a little doubtful; the Altar is at preſent in the Church-yard, it has been there a long time.

The Fragment d. I found in the front of a Houſe in the ſame Town, it is ſtill ſufficient to ſhew the real value which ought to have been ſet upon the Inſcription, if it had been entire: I was very ſenſible at firſt view that Hiſtory would receive ſome light from this, if perfect; and in order to retrieve the remaining part (which I am perſwaded is ſtill buried in the Ruins) I proffer'd any reaſonable gratification to whoſoever would undertake to procure it for me, but had the ungrateful anſwer, that the perſon who found this being dead, no other body could go to the place where it was formerly digged up. This, Sir, plainly ſhews the irretrievable loſs Learning ſuſtains by the ſluggiſh neglect of ſome men.

From hence I travell'd upon this Street almoſt to *Reſingham*; it is very viſible all this way; about a mile South from *Reſingham* there is a Pillar of about eight foot in length, which has ſtood by the way ſide, but is now fallen: At this Place I was ſhewn the Inſcription c. in a Wall on the inſide of a Houſe: I got a Medal which was found here a year ago, 'tis a Braſs one, the Emperors name worn out, AVG PIVS very legible, but by the figures of other Medals I take it to be *Antoninus*; on the Reverſe a Wolf, without any Iuſcription.

The next *Roman* Town I viſited was *Rocheſter*; *Watlingſtreet* is very viſible ſome part of it, but how far I cannot tell, not having traced it. I found the Altar f. near this place. I cannot ſay this is the largeſt, but think it has been one of the beſt fortified Places the *Romans* have been Maſters of in the North: and indeed it ſtood in need of being ſo, ſince it was not only a Frontier Town, but, as *Maeſtricht* is at preſent, was ſurrounded by Enemies.

From this Place I return'd to the *Roman* Wall at *Carrow*, between which and *Walwich* the Wall has been repair'd, and fronted with its old Stones again,upon which I found the Inſcriptions Tab. 2. No 1. 2. 3. 4. *&c.*Theſe,tho of ſmall moment,I took pains to copy and tranſmit to you, being a thing (to me) new: and I doubt not but it's poſſible to meet with many more of this nature, when I have an opportunity of ſpending a little more time than I had at collecting theſe; which I intend as ſoon as buſineſs permits.

As to the report of uncommon Plants growing on or near the Wall, I find it groundleſs, unleſs ſome are pleas'd to think the *Saxifraga alba radiu granuloſa* I B to be ſuch; but I can aſſure you that it is not at all uncommon in our Northern Climate. I make bold to ſubſcribe my ſelf

Stockton, May 29. 1702.

Your moſt obliged Servant,

Chriſ. Hunter.

BRITISH MUSEUM NATURAL HISTORY.

O oooooo I. Ob-

Tab: 2.

Fig: 2.

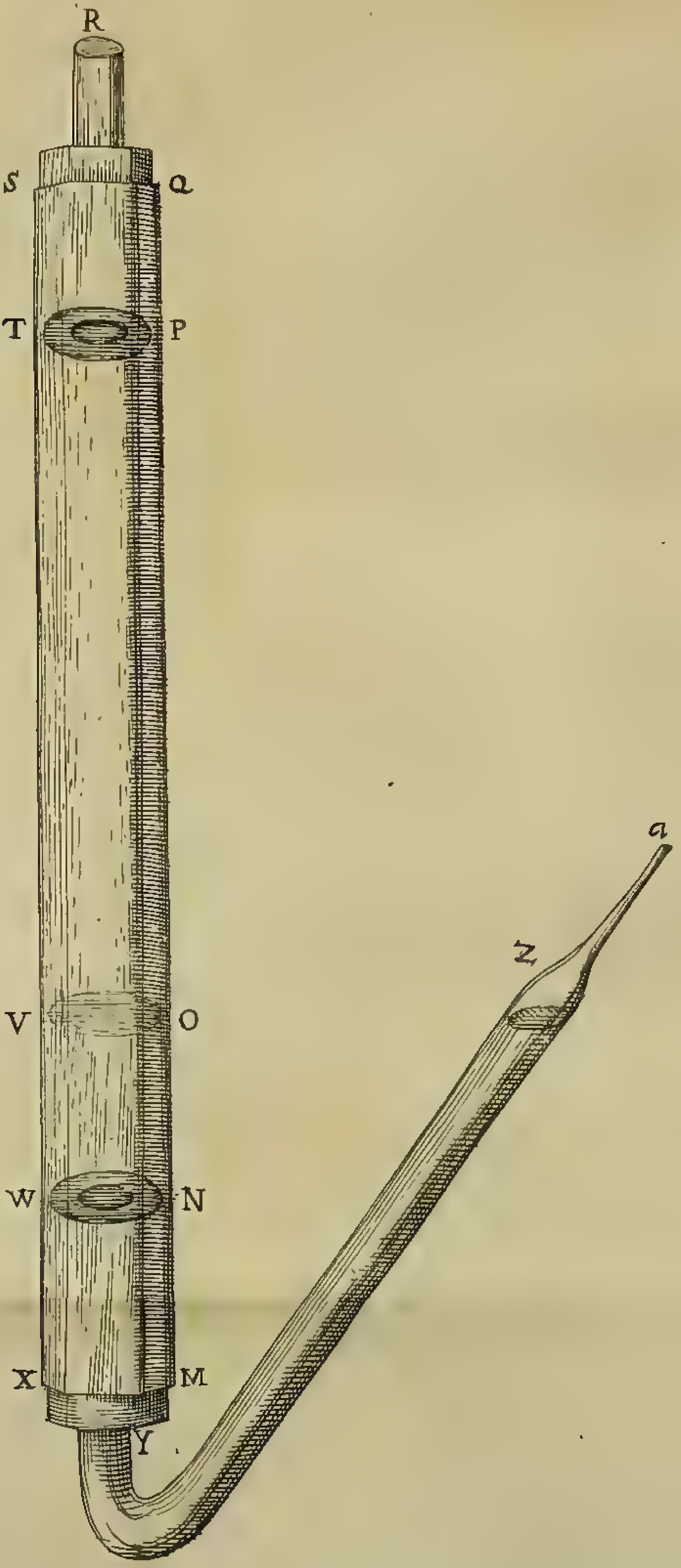
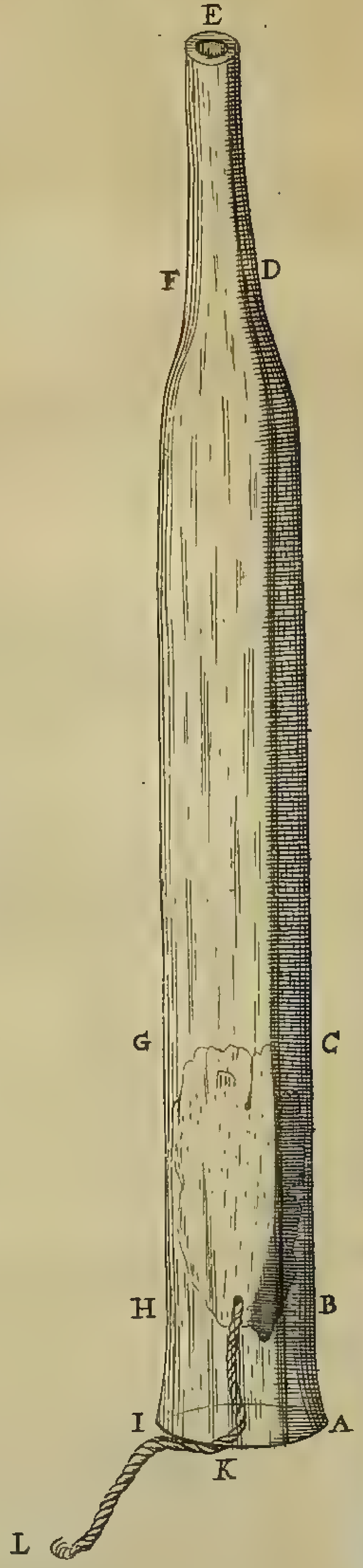


Fig: 1.



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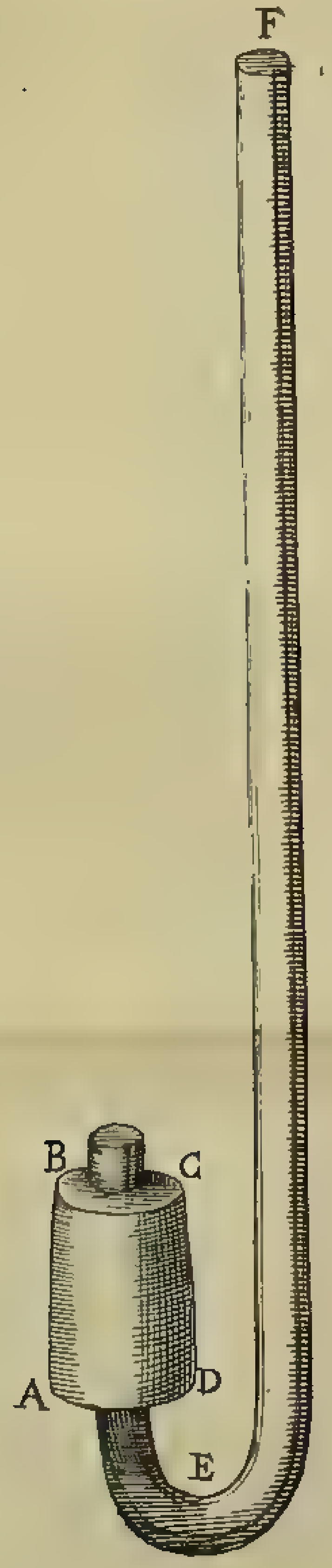
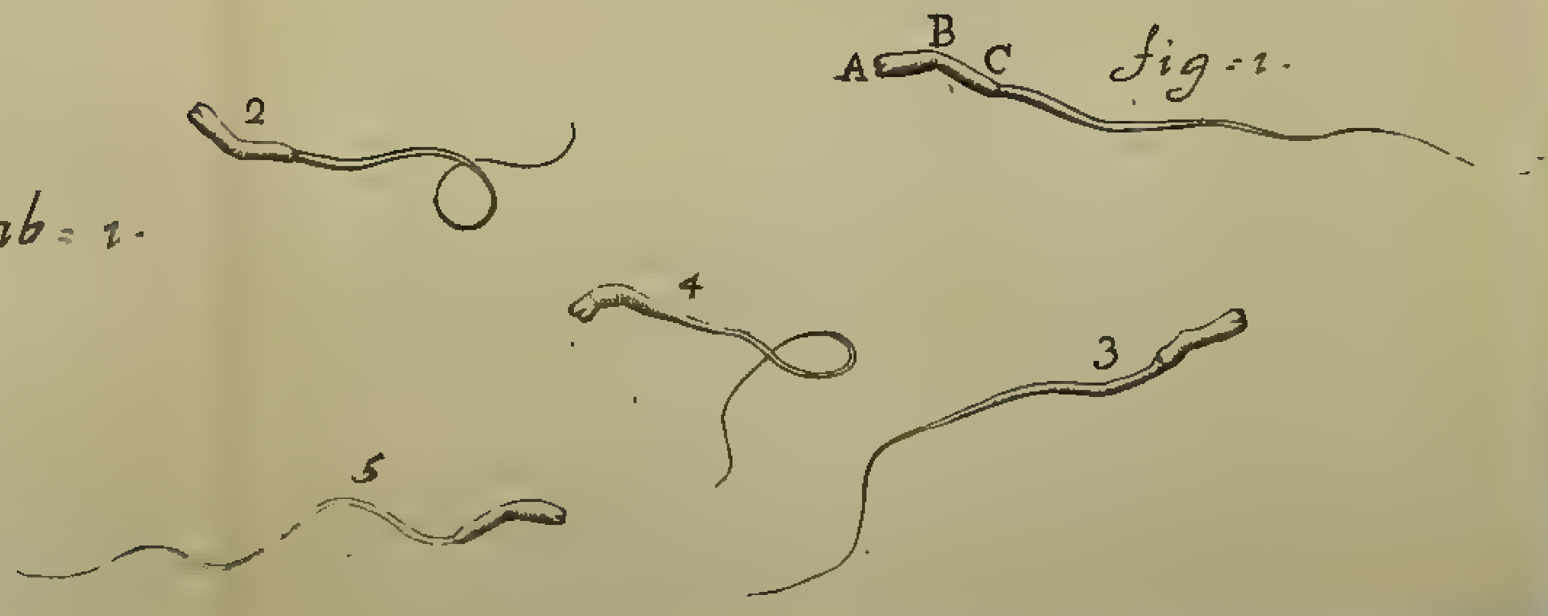


Fig: 1.

Tab: 1.



(Numb. 279.)

PHILOSOPHICAL TRANSACTIONS.

For the Months of May *and* June, 1702.

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I. *Obſervations on the Planting and Culture of Tobacco in* Zeylan, *by Mr* Strachan.

II. *Part of ſome Letters from Mr* Anthony van Lewuenhoeck, *F. R. S. to the Royal Society, and the Right Honourable the Lord* Somers *their Preſident, containing ſeveral Microſcopical Obſervations and Experiments concerning the* Animalcula *in* Semine Maſculino *of Cocks and Spiders, Shortneſs of Breath,* &c.

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IV. *Part of a Letter to the Publiſher, concerning ſome* Roman *Coins, and other matters lately obſerved in* Lincolnſhire.

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VI. *Obſervations on the Claſs of Sweet Taſtes, made by comparing the Taſtes of Sweet Plants with Monſieur* L' Emery's *Chymical Analyſis of them, in his Treatiſe of Drugs, by Sir* John Floyer.

I. *Obſervations on the Planting and Culture of Tobacco in* Zeylan, *by Mr* Strachan.

THere are two ſorts of Tobacco, which both they call *Dunkol*, the ſignification is a Smoaking Leaf, for *Dun* is Smoak, *kol* a Leaf, the one they call *Hingele Dunkol* or *Singele Dunkol*, for they make no diſtinction of *H* and *S*; the other is called *Dunkol Kapada*, which word *Kapada* ſignifies gelding, and is derived from the *Portugueſe*; which Tobacco is very intoxicating, and much ſtronger than the former, it is the ſame Plant, the difference is only that *Singeleſe* Tobacco has little attendance, upon the other a great deal of pains is taken until it be fit for uſe, and it is done after the following manner.

They clear a little piece of Ground, in which they ſow the Seed of Tobacco, as the Gardiners here ſow Parſly and Coleworts; againſt the time that this is ready for tranſplanting, they chooſe a piece of Ground, which they Hedge about; when the Buffelo's begins to chew the Cud, they are put within this Hedge Ground, and let ſtand until they have done, and this they continue day and night, until the Ground be ſufficiently dunged, then the Ground is tilled with a Spade, in form of a Pick-axe, ſuch as Carpenters uſe when they ſmooth Planks, by howeing the Ground, and turning the ſame, and mixing the Dung among the Earth; when they have made the Ground ſmooth, they remove the Plants out of the Bed wherein they were ſown, and ſet them in this Ground, about a foot diſtance one from another, and then they grow up almoſt like a

Dock ; when the ſtem has got 15 Leaves, they cut off all the tops of the Plants ; if they deſire not to have the Tobacco to be very ſtrong, they let it grow until it have 18 or 20, if they will have it ſtronger, they top it when it has got 10 or 12 Leaves, not counting the 3 or 4 loweſt Leaves; which are neareſt the Ground, becauſe they never grow ſo big and good as thoſe above them. Thus the moiſture of the Ground being hindred to waſte in more Leaves, Flowers and Seed, all the ſaid moiſture enters into the Leaves remaining, ſo that theſe Leaves will be 4 or 5 times larger, fuller of fatneſs, ſtrength and vertue, than the Tobacco which is not ordered after this manner. Now the moiſture aſcending from the Root, being conſtrained within the bounds of theſe Leaves, forces his way betwixt the Stem and Leaves remaining, and ſends forth young Sprouts, and would grow forth in Branches, if no care were taken to hinder. Therefore every 3 or 4 days they go through all the Stems, and break off theſe Buds whenever they ſpring forth, and this they continue until theſe Leaves be ripe (which takes as much time as the *Singele* Tobacco does, which gets Flowers and ripe Seed, and then begins to wither and ſpoil if, no uſe be made of it) which is known by the thickneſs and firmneſs.

Then before the Leaf begins to wither and is green, they cut down the Stem together with the Leaves, and do bring them into their Houſes, and lay them in a heap ; and thus the Leaves will begin to ferment, turn hot and ſweat, then when the Leaves begins to ſweat, they turn the innermoſt outmoſt, that they may eaſily ferment, otherwiſe the innermoſt would ferment too much, ſpoil and rot ; thus the longer they lye in a heap together, the Tobacco turns the more dark of colour. When they think it has ſweat enough, they hang it aſunder upon Cords, until the Leaves be dry, then they ſeparate the Leaves from the Stalks, and lay them up in bundles together until they have uſe for them.

Now the other Tobacco, called *Singele Dunkol*, is only Sown and then Planted, and has liberty to grow, to ſhoot out Flower and Seed, thus all ripen together, then it is cut down and caſt together in a heap; ſome will ferment too much and rot, others will ferment not at all, and will remain green, altho it be dry, and will have a ſmell of Hay or dry Graſs. The Souldiers, who delight to Smoak a big Pipe full, and that frequently in one day do Smoak this common ſort, ſome will mix ſome of the *Kapada* among it; the *Cingualeſes*, who ſmoak not ſo much at once, neither ſo frequently, do take a piece of the *Kapada* and roll it together, then roll a piece of dry Leaf of the *Wattukan* Trees about this, and kindle it at one end and ſuck at the other until it be conſumed. Some do chew it among Betle, taking but very little at once.

II. *Part of ſome Letters from Mr* Anthony van Lewuenhoeck, *F. R. S. to the Royal* Society, *and the Right Honourable the Lord* Somers *their Preſident, containing ſeveral Microſcopical Obſervations and Experiments concerning the* Animalcula *in* Semine Maſculino *of Cocks and Spiders, Shortneſs of Breath, &c.*

Delf, Decemb. 1701.

I Take the Liberty of ſending your Lordſhip ſome little Figures and Obſervations which I made partly the laſt year, and partly this.

In my Letter of the 25th of *Decemb.* 1700. I told the Society that I had made ſome Remarks on the *Semen Maſculinum* of a young Cock that was but half grown, and that I ſhould conſider it farther before I gave you my Thoughts upon that ſubject.

I have often obſerved, that young Cocks that are not arrived to half their Growth were wont to Teaſe the young Hens to couple with them, which theſe laſt always refuſed till they had laid Eggs, that is to ſay, till they were 3 or 4 months old.

This made me conclude that when the young Cocks were thus ſtimulated to Copulation, the *Animalcula* in their Seed were living, which upon view I always found to be ſo, as did many others to whom I imparted the ſtrange ſight of infinite numbers of theſe Living Creatures ; and the laſt perſon that view'd them through my Microſcopes was of opinion that he ſaw Millions of thoſe little Creatures, tho the whole Drop of Seed in which they lay was to the Naked Eye no bigger than a great, but ſingle Sand.

Laſt Summer I open'd the Seminal Veſſels of a young Cock that was newly kill'd, pluckt, and ſtill warm; in which I likewiſe diſcover'd theſe *Animalcula* ſtill living; and they remain'd alive for the ſpace of half an hour after I had ſqueez'd a Drop of the Seed out of the ſaid Veſſels.

I was formerly of opinion, that the *Animalcula in Semine Maſculino* of a Cock (as they then appear'd to me, both ſwimming in their Fluid Matter, as alſo after they were Dead) were in Shape like our River-Eels, but by my late Obſervations I find I was miſtaken in my Thoughts; for now they appear, both in motion and when they lye ſtill, as if the fore-part of their Body were crooked or Circular.

Not content with my own Obſervations, I took a great deal of pains to give the Limner a Diſtinct View of them; which happen'd very well, and is as follows.

Tab. 1. Fig. 1. A B C D Repreſents one of thoſe little Creatures in its whole length, whereof A B C is the Body, which is ſeldom quite ſtraight, but the Tail moſtly folded; and that was the occaſion of my error; for when I view'd them formerly, I thought I had ſeen their whole Body, whereas I now diſcover'd a long and exceeding ſmall Tail, which is ſhown by C D.

Theſe Tails were ſo wonderful fine, that I had much ado to make the Limner perceive them, for by reaſon of their ſmalneſs, they often eſcape the ſharpeſt ſight.

In the fore-part of the Bodies of many of thoſe *Animalcula* I diſcover'd a clear bright place, which was not to be ſeen in others; and the Tails of all theſe little Creatures that lay dead were ſo many Bows, which I caus'd the Limner to deſcribe in Tab. 1. Fig. 2. 3. 4. and 5.

From hence, I ſuppoſe, it is, that when I mentioned the *Animalcula in Semine Maſculino* of other Creatures, I took no notice of their long Tails, which without doubt they were provided with, as well as theſe in the Seed of young Cocks.

On the 17th of *Septemb.* 1701. about 10 of the Clock in the morning, I view'd again the *Semen Maſculinum* of a young Cock, which the Poulterer judged to be about twelve weeks old, it had been kill'd an hour before, and found the *Animalcula* full of Life.

I took ſome of the ſame Seed, about the quantity of a great Pin's head, and ſo order'd it, that very little of the fluid Matter could exhale.

I obſerv'd this Matter every hour, and in the ſame evening about ſeven of the Clock I found the *Animalcula* as lively as if they were proceeding from a Cock that was newly kill'd.

But about 8 or 9 a clock I could perceive that many of the *Animalcula* were dead, and that in one place, the ſpace whereof was no larger than a Sand, there were great ſholes of them living; but a little further, and in a place of much the ſame extent, I could not diſcover the leaſt Motion in thoſe that lay there.

The 18th of *September* in the morning, about ſeven a clock, and alſo at noon about twelve, I again made my Obſervations of the ſame Seed, as it lay in a Glaſs Tube, of the largeneſs of a thick Pin, but I could ſee no life in the *Animalcula*; but when I lookt upon another part of the ſame Matter, of the bigneſs of a great Sand, and ſpread very thin upon the Glaſs, I ſaw a great many very lively and nimble in their Motion, but their Life and Motion dwindled away till at laſt I could perceive none; the reaſon of which I judged to be, that the thin fluid Matter was all exhaled from the Seed, and that then the *Animalcula* dye preſently.

To ſatisfy my ſelf farther in this matter, I took a dead Cock that had been kill'd and pluckt the day before, between the hours of ſeven and nine in the morning, and opening the Body, I pull'd out the Guts and the Stomach, that I might the better come at the *Vaſa Seminalia Deferentia*, I ſqueez'd out of one of the Seminal Veſſels a Drop of the Seed, and preſently ſetting it before my Microſcope, I could ſee an infinite number of thoſe *Animalcula*, ſwimming in Legions together, and croſſing one another like Clouds in a ſtormy day, and as Briſk and Lively as if the Cock had been newly kill'd.

That part of the Intrails which I had taken out of the Cock, I put into the Body again, and drew the Skin over it, in order to take out a little more of the Seed about ſix hours after.

At noon accordingly I took out a little of the Seed, and found the *Animalcula* in the ſame ſtill living.

But in the evening about ſix having again taken ſome of the *Semen* out of the *Vaſa Deferentia*, I could not perceive any of them living.

Then I open'd thoſe Veſſels in ſeveral places, even where they terminate in the Teſticles, but the *Animalcula* were all dead.

Seeing now the *Animalcula* in *Semine Maſculino* are living when taken out of the Body of the Cock, warmth ſo long after the Cock itſelf is dead, who knows but as the ſame are placed for to faſten in the *Ovarium* or Egg-neſt of the Hen, not one Yolk, but many, which compoſe the Bed of Eggs, and ſo to impregnate them; the more becauſe we find, that with one Coition of the Cock and the Hen, moſt of the Eggs which the Hen lays in a month or two, are impregnated.

I have often thought too, whether or no the Yolks of the Eggs being in the *Ovarium*, and not having attain'd the hundredth part of their Growth, are not made for each of them to receive one of thoſe *Animalcula* from the Seed of the Cock, and to keep it there till the Yolk of the Egg be ſurrounded by the White, and the neceſſary Heat introduced; the more, becauſe we know that out of the White of the Egg the Chicken receives its firſt Growth.

Delft in *Holland*, *Decemb.* 20. 1701.

With the preſent I ſend you my farther Obſervations about Spiders, upon which ſubject there occurr'd to me what follows.

A certain Gentleman, that had often conſider'd the nature of Spiders, and their Copulation, told me that one could ſeldom meet with the Males of the great Spiders, and that he believed the Females did kill and eat up the Males.

This Gentleman had order'd his Gardener to kill no Spiders.

This Gentlemans Garden was large, and full of low Fruit-Trees, ſo that the great numbers of Spiders in thoſe Trees were very viſible to us; and I was told by the ſame Gentleman, that where we ſaw the Females of the ſmaller ſort of Spiders, there was alſo one Male; and I have obſerved the ſame.

Now that which this Gentleman took for the *Membrum Virile*, was quite otherwiſe, and I told him he was miſtaken; for the more I view'd them the more I was convinc'd that they were two Working Inſtruments, wherewith the Spiders take up their Food, and uſe alſo inſtead of ſhort Feet.

This my Aſſertion ſeem'd to the Gentleman Incredible; but when I placed the Working Inſtruments before my Microſcopes, and gave him a Proſpect of them he was fully ſatisfied; adding, that they could not be the *Membrum Virile*, and that unleſs he had ſeen them thro the Microſcopes, he ſhould never have believed them to be otherwiſe.

Moreover, ſince that time I have often been in places where Thiſtles, Nettles and other Weeds grew, where I ſaw ſeveral ſorts of Spiders, and in great numbers; and obſerv'd that when the Male Spiders approacht the Female, males, in order, as I thought, to couple, the Females always put the Males to flight.

I have ſeveral times taken up the Male Spiders, that I might obſerve their Seed, and have been fully ſatisfied that that little white Matter which I ſqueez'd ſeveral times out of the hinder part of their Bodies, and which was ſometimes as large as one grain of Sand, and ſometimes a little bigger, was nothing elſe but the Male Seed of theſe Creatures; I diſcover'd therein an infinite number of *Animalcula*, which continued ſo long living, till I was wearied with beholding them.

Theſe *Animalcula* were ſo exceeding ſmall, that I believe a thouſand millions of their Bodies joyn'd together would not be equal to a large grain of Sand, yet I will rather compare them (that I may be ſure not to be miſtaken) to a Barley Corn for bigneſs.

By reaſon of the infinite ſmalneſs of theſe Creatures, it was impoſſible for me to repreſent the Figure of their Bodies, nor of the Inſtruments thereof wherewith they moved ſo ſtrongly, as to continue living above 5 hours after they were ſeparated from the Bodies of the Spiders.

I had 10 or 12 other Male Spiders, in which I could diſcover no new *Phænomena*, ſo that I took it for granted that the *Membrum Virile* of theſe Creatures is in the hinder part of the Body, tho I never was ſo lucky as to obſerve an actual Copulation.

'Tis true, that in all the laſt Spiders I could perceive no Seed at all; but that I attributed to theſe reaſons, either the Male Seed was not yet Ripe enough in them, or it may be they had lately coupled before I took 'em. It has ſometimes happened to me, that in the preſſing their Seed out, I mixed their Excrements with it.

Since theſe Experiments I ſhut up ſeveral Spiders in a Glaſs Tube, and amongſt others 3 Males and 1 Female together, and after the ſpace of 2 days, I ſaw the Female fall upon the Males with ſuch violence, that the Blood ran out of their Feet; whereupon I kill'd the Female, and the next day I ſaw two of the Male Spiders lying dead, and the remaining Male Spider was eagerly devouring the Female.

I had three other Male Spiders that I had ſhut up in the Glaſs Tube twice 24 hours, and ſo having hinder'd them all that time from coupling with their Females, I concluded I ſhould find ſeed enough in all of them, and ſo indeed it happened, and I obſerv'd the *Animalcula* alive in it.

Delft in *Holland*, *Febr.* 14. 1702.

I Have been mightily perſwaded by ſeveral Gentlemen to ſend you the following Obſervations, together with the inclos'd Figures, if perhaps they may be of uſe to ſuch as are troubled with *Shortneſs of Breath.*

Some time before the King went for *England*, I had frequent Diſcourſe with a certain Phyſician about the Curing of Shortneſs of Breath; who told me, that he was well acquainted with all the ſorts of Balſam that were eſteem'd uſeful in that Diſeaſe, but that it was impoſſible to find any Vehicle that could inſinuate them effectually into the Lungs, and that in vain do they anoint the Breaſt and Stomach with Balſams that could never reach the Lungs, and that the Scent of the Balſam which exhaled from thoſe that us'd to anoint their Breaſt with Oyl, does not exhale from the Pipes of the Lungs, but was evaporated from the Breaſt by the Neck.

I was alſo perſwaded of the Truth of this Aſſertion, becauſe I am convinced that nothing that is in the Stomach or Bowels can be convey'd to the Lungs, unleſs it has firſt paſt thro the Heart; and conſequently much leſs can Balſams, wherewith we anoint our Breaſts, find any Paſſage into the Lungs.

Having conſider'd this Diſcourſe ſome days by my ſelf, and upon the ſixth of *January* laſt finding a very Learned Gentleman at my houſe, we fell into talk of *Shortneſs of Breath*; and I told him that the only means I could think of, to inſinuate the Inviſible Particles of Balſam into the Lungs, was to take a little piece of Silver or Copper, of the bigneſs of a Shilling, and making a ſmall hole in it, to fill the Cavity with a little Balſam proper for the Lungs of one that is troubled with a Shortneſs of Breath, and when that is done, let him place it upon the Tongue, and ſtopping his Noſtrils, let him admit no Air into his Lungs but thro his Mouth, nor Reſpire thro his Noſtrils, by which means the Subtil Particles of the Balſam, which I'll call the Spirits of it, may exhale and deſcend into the Pipes of the Lungs.

This Project of mine was approved of by the aforeſaid Gentleman; who added, that he did not doubt but I ſhould ſtill improve it if I thought farther upon that matter.

After the Departure of the ſaid Gentleman, I took two Glaſs Tubes, one of nine Inches, and t'other of eighteen long, and of half an Inch Diameter.

I made ſeveral Bends in theſe Glaſs Tubes, and made a ſmall Hole at the end of each of them, fit for my purpoſe, and in order to put it into one's Mouth, and filling it half full of Balſam, I placed it horizontally, that the Air paſſing over the Balſam might be convey'd into the Lungs, more ſtrongly tinged with the ſaid Balſam than it could be by the other Project.

But taking Counſel of my Pillow, I rejected this way alſo, and the next morning I took a Glaſs Tube, that was 15 Inches long and about one Inch in Diameter, as is deſign'd by Tab. 2. Fig. 1. A B C D E, &c.

That end which is put into the Mouth, in order to draw in the Air, is repreſented by DEF.

This Glaſs Tube being open at AIK is to be fill'd with a piece of Linnen, which we call Gawſe or Muſlin, or elſe a little bit of Spunge, of ſuch a ſize that it might be put into the Tube without preſſing, and that a Thread or String might be faſtned to it, in order to pull the Spunge or Linnen out of the Tube, as is to be ſeen in KL, and this Rag or Spunge is to be moiſten'd in Balſam good for the Lungs, before it is put into the Tube. See BCGH.

But conſidering, that if the ſaid Spunge did not touch the ſides of the Glaſs in every part, the Air would paſs by it, where there was no reſiſtance, as alſo that the Air would difficultly paſs thro the Linnen or Spunge that was dipt in Balſam, eſpecially if that were thick, I rejected this Tube alſo, and took another of the ſame length and breadth with the former, ſave only that this laſt Tube was very near of the ſame ſize throughout.

I rejected this Tube alſo after all my preparations, and I took another Tube of the ſame length and bigneſs with the former, with this difference only, that it was throughout of the ſame ſize.

This Tube, which is repreſented by Tab. 2. Fig 2. MNOP, *&c.* I ſtopt at each end with a Cork as at MNWX and PQST.

In the uppermoſt Cork PQST, I made a little round Hole quite thro, wherein I ſtrongly inſinuated a ſmall Glaſs Tube R, and ſo alſo I perforated the other Cork MNWX.

Having done this, I thruſt into the lowermoſt Cork another long Crooked Glaſs Tube which I had prepared on purpoſe, and it is deſcrib'd by the Letters YZ.

This laſt Tube YZ was taper'd into a ſlender end as Z a, with the intent, that the Air when ſuckt in at R ſhould come in leiſurely at the ſtrait paſſage ZA.

Having thus diſpoſed the great Tube, with the Cork ſo ſtrongly skrew'd in it, and the ſmall Tube in the Cork, that

not

not only no Water, but even no Air could enter therein, I judged that I had quite finiſht my Machine.

To make an Experiment how it might ſucceed, I drew the Cork P Q S T out of the Tube, and pour'd a little Brandy into it as in N O V W, and then having placed the ſaid Cork with the little Tube in it, into the great Tube again, and putting the ſmall Tube R between my Lips, and ſucking in the Air, which ruſht in at the ſmall end a of the Tube Y Z, and which was obliged to paſs thro the Brandy, I perceiv'd the Brandy to be put into a violent agitation and bubbling, and thereby the Spirits thereof, if I may ſo call them, made to riſe in an extraordinary manner up into the Mouth, and conſequently into the Lungs, as the Event did plainly demonſtrate.

If then the Exhalations or Volatile Particles of Balſams are render'd ſerviceable, not only for the comforting, but even for the curing of Weak and Crazy Lungs, and the more Spirits of theſe Balſams can be convey'd into the Lungs, the better will they fare, but I would not have the Air paſs ſo ſimply thro the Balſam, as it went thro the Brandy, when the Tube ſhould be filled with the former ſo far as it was with the latter, but intended to put the Glaſs Tube, ſo far as it is filled with Balſam in hot Water; however, in order to prevent the burſting of the Tube by too ſudden a Heat, it ought to be laid in a Baſon fit for the purpoſe, with ſome cold Water, pouring ſoftly a little boyling Water upon it to the heighth of the Balſam, or elſe to lay the Tube in a Baſon with the neceſſary quantity of Water, and put it upon Fire.

By this means the Spirits of the Balſams will exhale much more freely than if the Balſams were cold, and the Lungs will be ſo heated thereby (in my opinion) as to put the Patient into a gentle Sweat.

I have often thought with my ſelf too, that theſe Balſams, or at leaſt ſome Cordial Gums, Herbs or Juices, are not only good againſt Shortneſs of Breath, but alſo will preſerve the Lungs from cold ſtinking Miſt, and Peſtilential Airs.

I have been told, that the beſt Balſam for Shortneſs of Breath is the Balſam of *Peru*, which I never ſaw, neither did I intend to make the above-mentioned Inſtrument a Vehicle for Balſams, for I freely own, I have no skill of Balſams of Gums or Herbs, only this I have often experienced, that ſtinking ſmells are prejudicial to my Lungs.

I don't deſign to invite any body to make uſe of the ſaid Tube, beſides I have preſented it to an able Phyſician, who is well vers'd in thoſe Balſams, Gums, and Juices, that are good for the Lungs.

That Learned Perſon, that I mention'd before, ſetting the Tube to his Mouth, and breathing in the Spirits of the Brandy, I told him that we need not ſtop our Noſe when we draw in our Breath, but only remove the Tube, Tab. 2. Fig. 1. D E F from the Mouth, and then Breathing, to apply the Tube again to the Mouth; and this one is to repeat ſo long as one ſhall find any benefit by it; this Gentleman, I ſay, was ſo pleaſed with the Experiment, that he adviſed me to make it Publick, that the World might be the better for it.

Now in order to make the Glaſs Tube, Fig 1. as uſeful as the other, Fig. 2. I prepared ſuch another Inſtrument as is repreſented by Tab. 2. Fig. 3. A B C D E F, that I might place the Cork A B C D in Tab. 2. Fig. 1. at A I; and I made this Inſtrument or ſlender Glaſs Tube longer than that which in Fig. 2. is repreſented by Y Z a, upon this account, *viz.* that if one were inclin'd to put more Balſams or Juices into the Tube, this long Pipe might be thruſt up higher into the Water.

Now if we conſider the Structure of our Bodies, as far as they are known to us, we may firmly conclude that no part of us is expoſed to ſo many Evils as the Lungs, for how eaſily may they be hurt if we do but go into the Cold Air, which engenders and cauſes us to diſcharge Phlegm, to Cough and Spit, for how eaſily may the Globules of Blood in the fine Veſſels of the Lungs be coagulated by the Cold.

In order to get a further Light into theſe matters, I took the ſmalleſt of the Lungs of two ſeveral Sheep, that I might view thoſe parts with the Microſcope, and I was amazed to diſcover that the Air Veſſels were filled with *Pus* or Matter, even at the extremity or ſmalleſt part of the Lungs.

I got a Butcher, that was a good underſtanding man, to come and view the ſaid Lungs, and I ask'd him what was the Diſtemper of that Sheep; he felt the Lungs in ſeveral places, and ſhow'd me ſome hard parts about the length and breadth of two Fingers, and told me that that Sheep had caught cold, and that had occaſioned that Diſeaſe of his Lungs; and the ſame thing was atteſted by ſeveral other Butchers; I askt them whither the Sheep would not have died of that Diſeaſe, but was anſwered, that thoſe hard places often *diſappear* and remove again.

I could not diſcover the leaſt *Pus* or Matter in the Air Veſſels of the Lungs of two other Sheep, thoſe Lungs were of an agreeable Colour, and like the other.

Having view'd the outſide of the Lungs of a Sheep that had not been diſtemper'd, it ſeem'd to me that a great many ſmall Tranſparent Globules lay under the Membrane; but when I ſeparated the Membrane from the Liver, thoſe Tranſparent Globules appeared to be nothing elſe but ſmall Particles of Air preſt together into different and irregular Figures; and thoſe Air Globules ſeem to lye out of the Air Veſſels.

I took ſeveral pieces of the Lungs, and preſt the Blood out of the Veſſels in which it lay, as alſo their Air, and was amazed at the infinite number of Bubbles of Air that came out of the Veſſels, of which ſome of them were ſo exceeding ſmall, that they even eſcaped the ſight of my Microſcopes; thoſe Globules I did ſuppoſe to be contained in very fine Veſſels, and when the Blood and the Air was ſqueez'd out of that part of the Lungs. where there were no great Veſſels, the remaining ones, whoſe Tunics were exceeding fine, made together but a very ſmall Portion of Matter.

Moreover, I took the unſound Lungs of two other Sheep, and found in the handling that their parts were much harder than others that were not diſtemper'd, and that the Matter or *Pus* was ſtiffer or thicker in thoſe Lungs, than in the abovemention'd: looking on the external parts of theſe Lungs, I perceived in ſeveral places thereof Pellucid Particles, which far exceeded in largeneſs the Globules of Air ſpoken of before.

Theſe clear Particles were in ſome places of a greyiſh colour, but in others ſomething darker.

Having taken the laſt mentioned Particles out of the Lungs, they ſeem'd to be nothing but a hard *Matter*, and the more, becauſe upon parting them I could ſee no Air Globules among them; whereas in ſound Lungs, how ſmall ſoever the pieces thereof were, I could eaſily diſcover that (except the Veins) they conſiſted moſtly of Air Globules, which were not ſhut up within the Veins.

Now if the ſaid Tranſparent Particles were not in ſound Lungs, I ſhould conclude that all thoſe Particles would turn to a thin *Matter*, in order to be caſt out of the Lungs by the Sheep if it ſhould recover its former health.

If we look upon ſound Lungs, we ſhould be apt to affirm that thoſe alſo conſiſted of ſuch Tranſparent Particles, but upon a nearer view, I found that that Phenomenon was only occaſioned by a multitude of Blood Veſſels lying within the Membrane of the Lungs, and in ſeveral places ſeeming to divide the Globules of Air.

Being perſwaded now that all the Diſtempers in the Lungs of Sheep are occaſion'd by the Cold Air which thoſe Beaſts ſuck in, I ask'd two Butchers whence they thought the Diſeaſes of their Lungs to proceed, they anſwer'd, that the Sheeps running in the Meadows at the latter end of the Autumn, and eating Graſs that was either actually frozen, or cover'd with cold Dews, was the true reaſon their Lungs were thus ſpoil'd ; and that the ſame happen'd ſometimes in *May*.

But for my part, I ſhould rather conclude that the frozen Graſs does not hurt their Lungs, but Stomachs, and that the cold Air does not affect their Lungs.

Knowing that our Butchers fetch abundance of Fat Sheep from *Brabant*, and that thoſe Sheep are driven every morning into the Field, and folded every night by their Shepherds ; and that our Sheep, on the contrary, are brought into the Meadows in *May*, and there left till it Snows and Freezes ; I askt the Butcher whether the *Brabant* Sheep had ſuch bad Lungs as ours ; and was anſwer'd, Seldom or never.

From whence I was ſtill better ſatisfied, that the Diſeaſes in the Lungs of Sheep, and eſpecially of ſuch as lye in the Field in the long cold Nights, were occaſion'd by nothing elſe but their ſucking in the Cold Air.

I askt moreover whether ſuch Sheep were Fat whilſt they were kept up, and whether they could diſtinguiſh while living which had bad Lungs ; to which they anſwer'd, that thoſe whoſe Lungs were toucht, did never increaſe in fat after they were ſtall'd ; and that within a fortnights time after they had been ſhut up, and fed with Beans in order to fatning, the Diſtemper uſually diſcloſed it ſelf, for they did nothing but Cough, and therefore they always kill'd thoſe Sheep firſt.

Now if we allow that the Cold Air is ſo prejudicial to the Lungs, we ought not to wonder if ſuch an Inconvenience (as we call a Cold) comes upon them, tho we are able to diſcover from whence it proceeds.

Yea, I am of opinion, that in a long cold Winter the Lungs may be ſo much incommoded, that a great fit of

Sickneſs, and even Death itſelf, will be the Conſequence of it; for if we do but conſider what a deal of Phlegm one diſcharges in that Sickneſs which we call a Cold, and if it be Greeniſh it is almoſt a Purulent Matter, which comes out of the Air Veſſels of the Lungs, we are preſently frighted at it, and with reaſon, for the Diſeaſe may proceed ſo far that a Conſumption of the Lungs will follow.

My laſt long Sickneſs was ſuch a Cold, and it ſtuck ſo cloſe to me, and I voided ſo much Green Phlegm that I was afraid I ſhould never recover it; but I am now ſo well, that in the morning when I cough, it is nothing but a clear thick Matter of the quantity of a Grey Pea; from whence I conclude, that the Blood circulates naturally and freely thro the very ſmalleſt of the Veſſels of my Lungs, and that that clear Matter is nothing but an exhalation thro the Fibres of the fine Blood-Veſſels, and is the Serum of the Blood.

Having lately ſmelt ſome Cinnamon that was pounded in my Houſe, I thought of what Dr *Bontekoe* ſays about that Spice's being a great ſtrengthener of the Heart. I took therefore a fine piece of Cambrick, and put into it about 2 Thimbles full of ſtrong, and well beaten Cinnamon, and tying it up, placed it in the Glaſs Tube, Tab. 2. Fig. 1. B C G H. Then I ſet my mouth in that part of the Tube, markt E, and drawing in my breath at the ſame place, I could plainly perceive the inviſible exhaling particles of the Cinnamon to deſcend into my Lungs.

This Cinnamon being thus derived into the Pipes of the Lungs, we can't ſay that it ſtrengthens the Heart, but rather the Lungs, unleſs we will affirm that the one partakes of the advantage of the other.

III. *Another Letter from the ſame Mr* Leewuenhoek, *concerning his obſervations on Rain Water.*

Delft, April, 28. 1701.

ON the 19th of *Septemb.* 1701. it rain'd a little while about noon, whreupon I intercepted ſome of the Water in a fine *China* Baſon, made as clean as was poſſible.

I put this Water into a Glaſs Tube, in order to try whither there were any living Creatures in it.

I view'd this Water ſeveral days together, and could diſcover in it abundance of ſmall Atoms of Duſt or Particles that were floating in the Air, and conſiſting of exceeding ſmall parts of burnt Wood or Charcoal wherein I did perceive the Horizontal and Aſcending Veſſels, alſo a very ſmall piece of Straw, and ſeveral blackiſh Particles which I imagin'd to be conglomerated Atoms of the ſmoke proceeding from the Coals which our Brewers and Smiths uſe, and among theſe was an odd Phenomenon made up of little round Bubbles, that were, as I may ſay, congeal'd together, like our little Stars of Snow in Winter; but I could meet with no living Creatures till the 28th of *September*, at which time I diſcovered exceeding ſmall *Animalcula*, that one while faſten'd themſelves to the ſides of the Glaſs, and then ſwam in the Water with a tremulous motion, which was a very agreeable ſpectacle.

Theſe Creatures were ſo very ſmall, and the Glaſs Tube ſo thick, that it was very difficult for me to ſee them, and the more becauſe they were as Pellucid as the Glaſs itſelf; their Bodies were twice as long as they were big, and both ends thereof Taper, or dwindling into a ſmall Point.

From the 10th of *October* to the 14th I could find no living Creatures in the Water, tho I ſought them very carefully.

Whereas I was uſed only to obſerve the upper part of the Water in the Glaſs Tube, now on the 15th of *October* I turned my ſpeculations towards the bottom of the ſaid Tube, which was 4 inches long, and $\frac{1}{3}$ Diameter; and there I could perceive abundance of thoſe *Animalcula*, ſome ſitting on the ſides of the Glaſs, and others Swimming, and as they were in Shoals together, when one of the Company ſtirred, all the reſt that were near moved alſo.

Not content with theſe obſervations (becauſe it was poſſible that there had been Water in the Tube before, and that from thence theſe *Animalcula* might have proceeded) I took another Tube that had lain dry near 20 years in a Cheſt, and where I was well aſſured, that neither Water nor any other matter had been put, exeepting Air and ſuch Atoms as are always floating in it.

On the 18th of *October* it rained in the morning, after that we had had very ſtormy Weather for ſeveral days.

I received ſome of the ſaid Rain in a *China* Baſon, and twice I threw away what I had received, but the third time I put it into a Glaſs Tube.

I viewed this laſt Water ſeveral days, but notwithſtanding all the Pains I took, I could not diſcover any thing that had life in it, true it is, I ſaw little Particles fixt to the ſides of the Glaſs, that came very near in figure and ſize to the aforementioned *Animalcula*, but on the 24th ditto, I did diſcover plainly three of thoſe Creatures running on the Glaſs, and Swimming in the Water, not in a ſtrait line, but in circles and windings in their progreſſion, and the next day I could perceive in ten different places ſome of the *Animalcula* running, and others ſwimming, and that as diſtinctly, as when we ſee with our naked Eyes thoſe little Creatures which the Common People call Water Fleas, ſwimming in the ordinary Brooks and Canals.

Now I could obſerve againſt the ſides of the Glaſs, in the compaſs of a large Sand, above an hundred Particles that were of the ſize of the aforeſaid *Animalcula*, which Parties I viewed ſeveral times, in order to ſee, if it were poſſible, whether they were living Creatures, or whether there were any thereabouts; but with all my circumſpection I could diſcover nothing till the 28th of the ſaid Month of *October*, at which time I did perceive five and twenty *Animalcula* proceeding from the laſt mentioned Particles, and ſwimming or running about the ſides of the Glaſs; and then I did alſo obſerve two ſorts of theſe *Animalcula*, and the ſmalleſt ſort appeared to me, ſometimes ſhining and ſometimes not, which appearance I did imagin might proceed from the light reflected from the ſmooth back of thoſe Creatures, and this laſt ſort had quite a different motion in Swimming, from thoſe other which were a little bigger; in the remaining Particles that ſtuck to the ſides of the Tube I could perceive no alteration.

I farther obſerved the ſaid Water ſeveral days following, and was amazed to ſee the ſmalleſt ſort of theſe *Animalcula* in ſuch mighty numbers where-ever I caſt my Eye, either ſwimming or running about the ſides of the Tube; and whereas I held the Glaſs Tube full of Water in my hand, and conſequently put the Water in a gentle kind of motion, I could perceive that the Stream (if I may ſo call it) would often be too ſtrong for theſe *Animalcula*, and carry them along with it; and the chiefeſt difference I could find between theſe *Animalcula* and the inanimate Particles, which I told you I obſerved in the Water alſo, and which were very like the other, was, that the former made ſmall angles in their ſwimming, whereas the latter always moved in a right Line.

I have alſo obſerved, that when I put Water into a Glaſs Tube that had never been wet, abundance of Air-bubbles appeared, which ſtaid on the Glaſs a little while and then vaniſht.

That I might be better ſatisfied in this matter, on the 6th of *November* I took a new Glaſs Tube, and tho I had moſt carefully ſhut it up and cover'd it cloſe, I could ſee abundance of ſmall Particles in it.

On the ſame day it rain'd again, and I intercepted the Water as before, and put it into the Glaſs Tube, to ſee whither there were any Air-bubbles, and whether they would diſappear like the other.

I obſerved the Water ſeveral times, even after it had been four hours in the Tube, and in that time diſcover'd but 2 or 3 Air-bubbles, and that was in a dry Particle from whence the Air ſeem'd to proceed.

I had placed the fore-mentioned Tube perpendicularly, and another obliquely, but the laſt I laid down almoſt horizontally, only the Orifice of it was rais'd a little higher, that the Water might not run out of it, and that the Air-bubbles might keep their place in the uppermoſt parts of the Glaſs. After the ſpace of ten hours I ſaw a great number of Air-bubbles that were for the moſt part faſtned to the ſaid Atoms; and whereas we well know that no dry or other Particles that have Air included in them can admit of Water till the Air be diſlodged, this rule holds alſo in the Particles that are found in our Glaſs Tube; but what ſhall one ſay? Some of the Air-bubbles were a hundred, others ſeveral hundred times bigger than the Atoms to which they were fixt. The next day in the morning I could perceive but 4 very ſmall Air-bubbles, and a few hours after they were all gone.

I view'd this Water till the 14th of *Novemb.* but could not ſee any living Creatures in it, and the next day I had the ill luck to break my Tube.

A certain Fiſherman brought me ſome Eels that were no bigger than a large Pin, ſome of which, that were of a darkiſh colour, I obſerved before ſeveral perſons of Quality, who with great pleaſure could very diſtinctly ſee the the Blood circulate, notwithſtanding the exceeding ſmallneſs of the Veſſels; but the next day viewing by my ſelf one of thoſe little Creatures, that was changed almoſt white, I could hardly ſee the Circulation of the Blood, which even in the biggeſt veſſels (by reaſon of the few Globules in it) had ſcarce any Tincture of Red.

IV. *Part of a Letter to the Publiſher, concerning ſome* Roman *Coins, and other matters lately obſerved in* Lincolnſhire.

S I R,

THis comes only to acquaint you with what may not be improper to inſert in ſome of your next Philoſophical Tranſactions, *viz.* That in *July* laſt one *Edward Lenton*, who lives with one *Philip Wolverſton* of *Fleet* in *South Holland* in *Lincolnſhire*, being about to fence in a Hay-ſtack, and digging a grip for that purpoſe about the depth of half a yard, he ſtruck his Spade upon a Pot, which when he broke, (elſe nothing could be got out of it) there was no leſs than 36 pound weight of old *Roman* Copper Coin found in it. The Pieces were found ſet in rows edgeways one by another, and ſtuck ſo together with the Verdigreaſe or Ruſt of Copper, that many of them required a Chizel or ſome ſuch thing to ſeparate them; but being ſeparated, clean'd and brighten'd, the Heads or Figures of all or moſt of them were very fair, (ſome as when newly ſtamped,) and the Inſcriptions of many are very legible. The Fellow (who at firſt hoped for a better Treaſure, when he ſaw what the Pot produced) profuſely and careleſsly gave them away, and diſperſed them up and down the Country to ſuch as deſired them, and that, I ſuppoſe, for nothing, or next to nothing. Here was amaſs'd together a great variety of Coins in this Pot: They ſay Dr *Hart*, a Phyſician of *Wisbich*, has a dozen of the beſt Pieces; and an Apothecary at *Long Sutton* a ſcore of the ſame, the largeſt and moſt legible: and *Philip Wolverſton* himſelf has two or three, ſo very large and fair, that he ſays he will not part with them. Notwithſtanding there

hands,

is yet many pounds weight of them in *Edward Lenton's* hands, the man that found them, if he have not lately parted with them. The place where they were found is in the midſt of the vaſteſt Flat or Level in *England*, and in a Ground that for many Ages paſt, uſed to be cover'd with Water in the Winter, and overgrown with Reed in the Summer. 'Tis about a mile and a half South by Weſt from *Fleet Church*, and about as far South by Eaſt from *Holbeach*. There are no Banks or Hillocks, old Works or Ruins to be ſeen near it; nor any remains or tokens of any thing extraordinary to have been there; (but the old Sea Bank about two or three mile off; which *Dugdale* from a paſſage in *Tacitus* believes to be caſt up by the *Roman* Souldiers.) But all is as flat as the Sea, and a low Country, producing a Courſe Flaggy Graſs for the moſt part round about it. The Pot, which was narroweſt at the top and bottom, but thicker in the middle, had an Inſcription about it, which tho it ſeemeth in ſome of the Sherds or Pieces to be fair at firſt ſight, yet is not legible, tho what it may be to men skill'd in Antiquities I know not.

I thought it was neceſſary, that the Learned World ſhould know this, and ſo ſhould any ſecond *Dugdale*, that may afterwards write the Hiſtory and Antiquities of the Fenns: And I knew not whether any would Communicate it to you or no; and therefore I have ventured to do it. If you have fuller and better accounts, this will do no harm; if you have not, you may make what uſe you pleaſe of this. You need not know from whom this comes, but you may be aſſured of the truth of it.

I might have given you an account of ſome diſcoveries, at the laying a Tunnel under the *Welland* at *Spalding* in *Lincolnſhire*, about 5 or 6 years ago, *viz.* of Jettys Boats, Tannfats, and the knobs and great quantities of Ox Horns belonging thereto, and Shoe Soles of a very ſtrange unuſual form; all dug up at the depth of 12 or 14 foot. As alſo at the laying the *New Goat* at the fall of *Hammond Beck* into *Boſton Haven*, about 4 or 5 years ago, they found (at the ſame or greater depth, in a different Soil from what they had dug through) many Roots of Trees, where it is believed the ſurface of the old Country was before it was covered by the Sea, (as alſo at *Spalding*) But having given an account thereof to Mr *Ralph Thoresby* of *Leeds* in *Yorkſhire*, a year or two ago, if you think it worth the Recording, you may have it I ſuppoſe from him when you pleaſe.

V. *Part of a Letter from Mr* Thoresby, *F. R. S. to the Publiſher, giving a further account of the ſame.*

THE Perſon you inquire of, is, I am ſure an ingenious, obliging and good man, what you deſire a tranſcript of, I here ſend you in his own words.

'Near the River *Welland*, that runs thro the Town of '*Spalding* in *Lincolnſhire*, at the depth of above 8 or '10 foot, there were found *Jettys*, as they call them, 'to keep up the old Rivers Bank, and the head of a Tun'nel that emptied the Land-water into the old River; and 'at a conſiderable diſtance from the preſent River, I gueſs '20 or 30 yards, there were dug up (about the like depth) 'ſeveral old *Boats*, which things ſhew that anciently the Ri'ver was either much wider than now it is, or ran in another 'place, or both. On the other, *viz.* the North Weſt ſide of 'the River, and more upwards in the Town, were digg'd up '(at about the afore-mentioned depth) the remains of old '*Tanvats* or *Pits*, a great quantity of *Ox-horns*, and the 'Shoe-ſoles, which I told you of, and I think the very 'Tanners knobs, *&c.* which things ſhew, that the ſurface 'of the Country lay anciently much lower than now it 'does, and has been raiſed by the Seas throwing in its Sand 'in the Maritime parts (now moſt inhabited) and by the

‘*Moor* or *rotted Sedge* in the fenny parts next the high Country; the whole Level is about 50 miles in length, and 30 miles over in the broadeſt parts. No Record (Printed or MS) or Tradition whatſoever, (that I ever heard of) tell us when theſe Mutations here diſcoverable happened.

‘One thing further I will add, that lately at the laying of the preſent new Sluice or Goat (as they call it) at the end of *Hamorebeck*, at its fall into *Boſton* Haven, taking up the foundation of the old Goat, they met with the *roots of Trees*, many of them iſſuing from their ſeveral *Boles* or *Trunks*, ſpread in the Ground, which when they had taken up (Roots and Earth they grew in) they met with a ſolid Gravelly and Stony Soil of the high Country kind, (but black and diſcoloured by the change that had befaln it) upon which hard Earth they laid the Foundation of this new Goat, where theſe Roots were dug up, was certainly the ſurface of the old Country, the certain depth whereof I cannot now tell you, but that it was much deeper than that at *Spalding*, as the Land is there at preſent higher. The *Archimedean* Screw, or Screw-like Trunk or Cylinder, by which the Workmen cleared themſelves of Water was very pretty.

The matter of fact in theſe Relations is indiſputable, this worthy Perſon being an Eye-witneſs, whoſe Letter coming to hand when I was reading Mr *Rays* Phyſico-Theological Tract, concerning the great changes made in the Terraqueous Globe, I took it for an experimental confirmation of his Sentiments, that the great Level of the Fens running thro *Holland* in *Lincolnſhire*, the Iſle of *Ely* in *Cambridgeſhire* and *Marſhland* in *Norfolk*, was ſometimes part of the Sea, and aggerated by Earth brought down by Floods from the upper Grounds, by the great quantity of Mud there ſubſiding, which by degrees raiſed it up. When you ſee or write to that Ingenious Gentleman, pleaſe to preſent my humble ſervice to

himtim, and acquaint him herewith: I have ſometimes thought o have ſent him an additional Liſt of *Local Words*, which the before-mentioned *Goat (Eboracenſibus Goit)* puts me in mind of; the form of the *Shoe* was much like thoſe found with ſome Urns at *Kirby Thore* in *Weſtmorland*, as deſcrib'd in the Phil. Tranſ. No 158.

VI. *Obſervations on the Claſs of Sweet Taſtes, made by comparing the Taſtes of Sweet Plants with Monſieur* L' Emery*'s Chymical Analyſis of them, in his Treatiſe of Drugs, by Sir* John Floyer.

I Obſerve that by our Taſte we may diſcern all the Chymical Principles in Plants before their diſtillation, and that for want of a due obſervation of their Taſtes, Mr *L' Emery* has not fully deſcribed the Chymical Principles which Plants do yield in Diſtillation.

All Watery Plants ſhew their Phlegm as well to the Taſte as in Diſtillation; and in all dry woody Taſtes we obſerve the Earth, as well as we can by the Chymical Analyſis.

By the Mucilage and Gummyneſs, or Oily Taſte, we diſtinguiſh the Oyl of Plants, as well as by Diſtillation.

The Aromatical Smell ſhews us the volatility of the Oyl and Salt of Plants, and by the fœtidneſs we alſo know that the Oyl and Salt are in a volatile ſtate.

By the acrimony and pungency we know that there is a Volatile Salt in Plants, and by their burning taſte we find there is a Corroſive Salt in them.

By a crude rough Acidity we obſerve the Tartar, or eſſential Salt of Plants; but if the Acidity be of a Vinous ſmell, we obſerve that 'tis of middle ſtate of Digeſtion, and may be called a Vinous Tartar, and the Crude Tartar an Acerb Tartar, but if the Tartar had a pungent ſmell, then 'tis a Volatile Tartar, or Acid Acrid Tartar.

I will next deſcribe the principles obſervable in Sweet Taſtes, and their ſeveral Claſſes, but muſt firſt obſerve that Sweet Taſtes ſhew their Oyl by their ſlimy ſmoothneſs, and their Tartar is evident in their extracts, as in the Juice of Liquoriſh.

1. The Graſs ſweetens *gramen caninum* have much eſſential Salt and moderate Oyl, *Juncus equiſetum*, *arundo*, *typha*, *nymphæa*, are all of the Ruſh kind, ſweet and rough, and ſome of them have more Oyl, others more Acid, and that the moſt crude have more Oyl than Tartar.

2. The Corn Sweets, as Barley, Rye, Wheat, Oats, Rice, Millet, have much Oyl and eſſential Salt, and a little Volatile: So Bread yields Oyl and Eſſential and Volatile Salt.

Note, that Fermentation or the Fire produces the Volatile Salt, by exalting the Tartar into a Volatile Salt; and the ſlimy mealineſs in Corn ſupplies the Oyl. *Tragopogon* and *Scorzonera* are referable to the Graſs, and contain much Oyl, and eſſential Salt.

3. The Subacrid Sweets, as *Rampions*, *campanula*, *trachelium*, contain much Oyl and eſſential Salt, but the Acrimony in theſe Plants ſhews a Volatile Salt not deſcribed by the Chymiſt.

4. The Ferns contain Oyl and Eſſential Salt, as Polypody; but the Acrid principle is not obſerved by the Chymiſt, nor the fragrancy in Harts Tongue. *Oſmunda* and the *Capillaries* have more Oyl than Salt, becauſe more mucilaginous and crude.

5. All the Leguminous ſlimy Sweets have more Oyl than Tartar, but all much of both, as Broom, *Ononis*, *Aquilegia*, *fumaria*, Aſparagus, *ruſcus*, *thalictrum*, *polygonatum* *Sena*, *galega*, *lathyrus*, *luteola*, *periclymenum*, *glyciriza*, *pſyllium*, much Oyl and Volatile or Eſſential Salt.

Beans and Peas and Lentils have alſo a Volatile Salt and *lens aquatica.* Note, that ſince there is no Acrimony in theſe Seeds, the Volatile Salt is produced by the Fire.

The Aromatic Legumens, as *Melilotus*, have an exalted Oyl, and eſſential Salt.

Periclymenum is deſcribed to have only eſſential Salt and Oyl, but ſince there is an Aromatic Odor in the flavour, and a great Acrimony, there muſt be ſome degree of Volatile Salt in it.

Fenagreke and Meadow Trefoyl have much Oyl and little Salt,and ſo has *Ophioglоſſum pinguicula & conſolida regalis.*

6. The ſweet Nuts, as Almonds, have much Oyl and eſſential Salt, but the bitter have more Salt than the ſweet Almonds, therefore 'tis probable that the Tartar abounds more in all bitters, and that Tartar is the effect of a higher digeſtion, and the crudeſt Taſtes, as Styptics, Sweets and Slimes have leaſt of it. So Cheſnuts and Beech-nuts have much Oyl and little Salt. Filberds are deſcribed to have eſſential Salt, and a little Volatile as well as Oyl; but it ſeems no probability that one may have it, and none in any of the other.

7. The Sweet Acid or Vinous Taſtes have much Oyl and eſſential Salt, as Prunes, Cherries, Strawberries, Rasberries. The variety of the Taſtes of theſe Fruits ſhews the different digeſtions and mixtures, tho the principles are the ſame.

The Sweet Viſcous Fruits, as Sebeſtens, have little eſſential Salt, and much Oyl.

8. The Sweet Aromatic Burning Taſtes contain a Volatile Salt and Oyl, as *Schenanthus*, Ginger, Zed-Oary, Cubebs, Cardamums, *Vaynillas*, *contrayerva calamus aromaticus*; but theſe following are miſtaken by the Chymiſt, who ſay that *Coſtus amarus*, *dulcis*, *cyperus*, *galanga*. Orris, have a Volatile Oyl, but eſſential Salt only, for Orris is Acrid and Aromatic as well as the reſt, and therefore there is both Volatile Salt and Oyl in them, and alſo an eſſential Salt from their ſweetneſs.

9. The ſweet Acrid Aromaticks of the Fænil Claſs have all a Volatile Salt and a Volatile Oyl, as Angelica, Lovage, Parſly, Meum, Dill. Note, The Leaves and Roots of Fænil contain a Volatile Oyl and Eſſential Salt, the Seed a Volatile Oyl and Salt; but ſince the Roots and Leaves have a pungent Taſte, there is alſo a Volatile Salt in them, tho the Chymiſt do not obſerve it.

All the parts of Carraways have the odor of Punaiſes, except the Seed; from whence I may infer, that the fœtid Plants have the ſame principles as the Aromatics, *viz.* a Volatile Oyl and Salt; and this is confirmed by other fœtids which have them, as Rue and *Aſſa fœtida*, and *Vulvaria*. *Peucedanum* is deſcibed of a bitter acid Taſte, with the odor of Pitch, and muſt have a Volatile Salt, tho *L' Emery* deſcribes only its eſſential Salt and Oyl: So in Smallage he deſcribes only the eſſential Salt and Oyl, but its Acrid Taſte manifeſts the Volatile Salt.

10. The Sweet Gums, as Manna, Sarcocolla, contain much Oyl and eſſential Salt; tho Honey and Sugar have more eſſential Salt than Oyl; by which we may obſerve how much eſſential Salt is in all Sweets, and why they are apt to turn ſowre, and ferment; and from ſuch ſweet Gums all ſweet Plants have their Acid and Oyl upon Diſtillation.

11. Citrulls, Melons, Gourds, Cucumbers, which are bitter Sweets, and very mucilaginous, contain much Oyl and little Salt.

Since the whole Claſſes of Sweet Plants contain an Oyl and Eſſential Salt, ſome more ſome leſs of both, the Vertues of the ſeveral ſweet Taſtes can never be explained by the Chymical Principles, and no new Virtues by them is diſcovered; therefore all the advantage we have obtained by theſe Chymical Diſtillations is only to ſhew the nature of Sweetneſs in general, by diſcovering the principles contained in ſweet Plants, and this is a greater advantage to Natural Philoſophy than to Phyſick, to which the taſting of Plants is more uſeful.

By the Taſte we diſtinguiſh the Sweets into their ſeveral Claſſes, and we diſcern tempers and digeſtion, and mixture of their principles, and thence eaſily gueſs at their effects in Animals, and by the Taſte we diſtinguiſh the different ſtate of both the Oyl and Acid in Plants of different ſweet Taſtes; whereas the Chymiſts obſerve no difference of the Tartar Acid, whether it be Acerb, or Vinous, or Volatile; nor of the ſweet Oyls from the bitter and ſlimy.

By the Taſte we diſtinguiſh the Acrid and the Acid Salts, which mix in diſtillation; and they are not well diſtinguiſhed by the Chymiſts.

By the Taſte we diſcern when the Fire makes new products and mixtures, not naturally found in Plants; for in Corn, Beans, Peas, Bread, Fire produces a Volatile Salt not obſervable in them before: And a Volatile Salt is drawn from the lees of Wine by the Fire; and Leven yields alſo a Volatile Salt; whereas before in Corn only an Oyl and Acid were obſerved; and 'tis probable that the Tartar is Volatilized, both by the Fermentation and the Fire.

Coffee is a Bean by its Taſte and Cods, and acquires a Volatile Salt by roaſting; but *L'Emery* only mentions its Oyl and fixed Salt upon Diſtillation, but the fixed Salt is the effect of Fire, and its virtue depends on the Volatile.

No more Chymiſtry is neceſſary for the diſcovery of the Phyſical Vertues of Plants, than to make Decoctions of them in fair Water, and to obſerve the Taſtes and other ſenſible qualities of thoſe Decoctions, and from them to take the natural hints for the tryal of their Virtues on Animal Bodies. I will confine my ſelf to the Claſs of Sweet Taſtes, and give an account of ſeveral Decoctions made in all the ſpecies of ſweet Plants, and add ſome Taſtes I had not formerly deſcribed fully, and ſuch reaſons as induced me to place them in the Claſs of Sweet Plants.

I hope theſe objections againſt Decoctions, that the Volatile parts expire, and the mucilage diſſolving in the Water obſcures the Taſte; I therefore do confeſs, that Plants are beſt taſted in their natural ſtate to diſcover all their Vertues, but theſe Decoctions do help to confirm our Taſtes, and diſcover the great variety of Medicines which may be made from Sweet Taſtes. Note, that all Decoctions muſt be taſted cold.

A Deſcription of the Taſtes and other ſenſible qualities in the Decoctions of Plants of the Sweet claſs.

1. THe Graſs Sweets, under which are contained all ſorts of Graſſes and Ruſhes, Reeds and Corn; I refer *Nymphea Alba* to the Ruſhes, both for its figure and taſte, which is crude and ſtyptic, with a bitteriſhneſs in the Seed; but the flowers are like Lillies of a ſweet ſmell, and mucilaginous, ſweet, ſtyptic in Taſte.

I boyled Horſe-tayl a handful in a pint of Water, and I found the Decoction to taſte very Styptic with a bitteriſhneſs, and the Decoction looked like Small Beer, the Taſte being like Ruſhes: I concluded it to be of the ſame Claſs. The Styptic Virtue is uſeful for all Fluxes.

Plantago aquatica boyled in Water gave a Cauſtic Acrid Taſte, joyned with a crude ruſh Taſte; the Decoction was greeniſh and pale. This Cauſtic Acrimony is uſeful in the Scurvy and Dropſy. It is *a ranunculus*, by its *capitula echinata*, as well as by its Acrimony.

Nymphæa lutea has a ſweet Aſtringent luſtre in the Flowers, with an Acrid ſmell like Creſſes.

A Reed is of a ſweet bitter and mucilaginous Taſte, it abſterges by the bitter without Acrimony, and cools by the Mucilage Subacrid Styptic, by which 'tis a Ruſh.

Sagittara is Sweet, Subacrid and Styptic, by which it is a Ruſh.

Alga Marina is Subacrid and Sweet, and ſomething Styptic.

Fucus is of a ſweet Saltiſh Taſte.

The Palm-Tree is Sweet and Styptic, and becauſe of this Taſte and its *folia arundinacea*, I refer it to the ſweet Styptic; a ſweet Vinous Juice flows from its Bark being wounded, the Immature Fruit is very Styptick, but the mature ſweet, viſcid, vinous, and ſubaſtringent, proper for Fluxes.

Wine, Vinegar and Sugar are made from the ſweet Juice.

The Inſpiſſate juice of the Palm Tree is the *Terra Japonica*, whoſe ſubſtance is gummoſe, and of a bitteriſh Styptic Taſte, and alſo of a ſweet Taſte, and of a grateful odor. Boyl ℥j of *Terra Japanica* in ℔j of Water, and ſweeten it for a Cough or Looſeneſs.

Leven is obſerved by *Ætius* to be cool by its acidity, to be hot being putrid, and alſo to have ſome Virtue from the Salt and Flower. He obſerves that Beer is hotter than Barley, and becauſe of its putrifaction 'tis of an ill juice; and he alſo obſerves, its Windineſs depends on the Air included in it; and the Wateriſh Beer and the Acid is cooling.

All theſe Virtues were diſcovered by the ſenſible qualities of Leven and Beer, without Chymiſtry. And we may obſerve that what we call Fermentation in them, was called by *Ætius* a Putrifaction. We have rectified the notion, and given it a new name, but the Antients knew the nature and effects of Fermentation as well as the Moderns; and 'tis that which gives the different ſtates of the principles in Plants, and the ſeveral ſtates are beſt diſcovered by our Taſtes and Sences.

I boyled *Gramen ſpica ſecalina*, and the Decoction was of a ſweet, mucilaginous and ſtyptic Taſte.

The Roots of Graſs have ſomething of Acrimony and Aſtriction, but the Decoction taſtes ſmooth and ſweetiſh. The green Leaves of Graſs are ſweet and ſtyptic. The Decoction of the Water was of a pale colour.

The Seeds of Graſs are more diuretick and binding, I made a Decoction of them, which reſembled Water-gruel.

Paronychia foliis rutaceis muſt be referred to the Graſſes, becauſe of its ſweetneſs.

2. Quere whether *Rapunculus* be not of the Sweet Claſs, becauſe the whole Plant is Sweet and Milky, and for that both are given to Nurſes to increaſe Milk. The Roots of the rampions are ſomething ſtyptic and cooling, and proper againſt Inflamations.

Scorzonera and *Tragopogon* are referrable to the Graſſes, becauſe of their geniculate Stalks, their Graſſy Leaves, ſweet Taſtes and Milky Juice, the Decoction was ſmooth and of a pale colour.

Trachelium is alſo Sweet, Milky, Subacrid, and Bitteriſh, of the ſame claſs.

3. The ſweet mucilaginous and crude *Lychnis*, the decoction of *Alſine*, is ſweetiſh and mucilaginous, the colour pale like Small Beer. I could obſerve no aſtringency in *Alſine*. I boyled ℥j in a pint of Water, it hath a cooling and moyſtning quality like common *Lychnis*. *Dioſcorides* ſays, Chickweed being bruiſed has the ſmell of a Cucumber.

All the common *Lychnis*'s are bitter ſweets, and them I ſhall refer to the claſs of Bitters, tho their joynted Stalks and Sweetneſs may juſtly place them here, yet their chief Phyſical Virtue is from their Bitterneſs.

4. The Sweet Bitteriſh Styptic, and Subacrid Fern.

I boyled ℥j of Fern-Roots in ℔j of Water to half, the Taſte was very Styptic and Bitteriſh, the Colour Citron.

The Mucilage and Stypticity make Fern an excellent Vulnerary, and Styptic in all Fluxes: the young Buds rubbed in the Fingers ſwell ſomething like a Kernel, or the Laurel ſmell.

Dryopteris is deſcribed Aſtringent and Sweet, Acid and Bitteriſh.

Hemionitis has both Aſtringency and Bitterneſs.

Adiauthum album & nigrum are Sweet and Styptic, and ſince Experience ſhews theſe to be good Pectorals, the other Ferns have the ſame Pectoral Vertue, as *Vulneraries*.

Herniaria is deſcribed as a Styptic.

In *Adianthum* there is ſomething odorate. *L' Emery.*

Polypody is Bitteriſh, Sweet and Aſtringent, Nauſeous and Subacrid and Slimy, it purges by this Taſte both Choler and Flegm.

I boyled Harts Tongue ℥j in ℔j of Water to half; it was of the colour of Small Beer; the Taſte was Mucilaginous, Sweet, Styptic, with an Aromatick flavor of Raſberries or Orris, which is its Cordial Vertue, joyned with Stypticity and Mucilage, by which 'tis proper for hot Hypochondriacs.

The Roots of *Oſmunda* are of a Subacrid and Bitteriſh Taſte, beſides the Aſtringency, by which they open, but the Aſtringency much hinders that effect.

5. The Sweet, Acrid, Aromatics and Fœtids, the Roots have more Sweetneſs and Aromatic Acrimony than the Leaves, which are more crude; the Seeds have moſt Aromatic Acrimony.

The Seeds of *Siler montanum* have an ungrateful ſmell like Cummin, and a Bitteriſh Taſte.

Peucedanum is Bitter and Sweet. The Green Leaves of Coriander are fœtid like *Punaiſes*.

Laſerpitium is Acrid, Aromatic in Smell, and of a Sweet, Acrid, Aromatic Taſte.

Sampire is of an Acrid Aromatic Taſte, and the Smell of Smallage.

Cumin is Acrid, Aromatic and Bitteriſh, and of a diſagreeable Smell.

Dracumulus Hortenſis is ſweet like Anis.

Ferula has an ungrateful Aromatic Odor.

The Seed of *Meum* is bitter.

Cachrys is Bitter, Acrid, Aromatic.

Cancalis and *Daucus* agree in Virtue and Taſte.

Saxifragia pratenſis has a great Root, Sweet and Acrid; the Leaves are moſt Aromatic, and the Seeds; it reſembles the Taſte of Parſly.

The Leaves of *Gingidium* are of a diſagreeable ſtrong ſmell, and the Roots bitter.

Tordylium is Sweet, Aromatic, *gravi odore*.

Percipier is like Chervil, and ſo is *Pecten Veneris*.

I refer the Umbells to the Graſſes, becauſe of their Sweetneſs and Joynted Stalks. Our Botaniſts have omitted the ſweet Taſte in ſome of them, which are bitter. Moſt of them are of an Aromatic Smell and Taſte, but ſome are fœtid, viroſe and fervid in their Taſte.

Smyrnium Root has the ſmell of Myrrh, with a Bitter Acrid Taſte; and it helps the Urine and the Menſes like it.

The colour of the Specifick Juice is various; *Thyſſelinum* and *Seſeli praterſe* have a Milk: The Ferula's are Milky, or have a Saffron colour: Their Juices make *Sagapenum* and *Galbanum.*

The Juice of the Root of Peucedanum is reddiſh, and is called *Opoponax odore piceo vinſo.*

The Root of *Syphondylium* has a Saffron coloured Juice, of a fœtid and bitteriſh Taſte.

'Tis obſerved that ſome Seeds grow bitter by the fault of the ſoyl in which they grow. All of this claſs have a Volatile Oyl and Acrid Salt, by which they are diuretic, carminative, and pectoral, alſo by their ſweetneſs, Emmenagogue, if fœtid.

I boyled Parſley Roots ℥j in ℔j of Water to half, the Taſte was Sweet, and Acrid, Aromatic, the Colour pale.

The Roots of *Meum* are Acrid, and ſmell ſtrong; too much of it offends the Head.

Libanotis has the ſmell and taſte of the Seed of Angelica.

Sium or *Apium paluſtre fol. Oblongis* has an odor of Bitumen on all the Plant.

Thyſſelinum is Bitter, Ingrate and Acrid.

The Decoction of Angelica Roots are bitteriſh, Aromatic, Acrid, and of a yellowiſh Colour.

Imperatoria Roots decocted ſmelled like Angelica, and taſted very Bitter and Acrid; of a green Colour.

6. The Sweet, Acrid, Terebinthinate and Styptic.

Calamus, *Nardus*, *Cyperus*, agree in their Diuretic, Carminative and Emmenagogue Virtue, and their Stypticity, *&c.*

Calamus reſembles a Reed; it is an *Acorus*, the Taſte reſembles the Turpentine Plants, as well as its Cones.

Juncus odoratus is a Ruſh, with the ſmell of a Roſe, when rubbed of a Burning, Acrid, Aromatic and Bitteriſh Taſte.

Cyperus is of a pleaſant Odor, like *Lign. Aloes* whilſt it flowers, and of an Acrid, Aromatic, Bitteriſh, Styptic Taſte.

Nardus reſembles the flavor of *Cyperus*; 'tis Bitteriſh, Aſtringent, Acrid and Aromatic.

The Roots of *Cyperus* are uſed for *Nardus.*

There is ſome fœtor in *Valerian*, *Aſurum*, *Serpentaria*, whoſe Roots have a little Sweetneſs, with a Terebinthinate Bitter Acrid, and all of them reſemble *Spikenard odoris gravitate*, and have the ſame Diuretic, Carminative, Emmenagogue Vertue, and are proper for Malignant Fevers; and a little Styptic.

The Red Valerian has a crude Taſte in the Stalks and Leaves, the Flowers rubbed ſmell like Turpentine; the Leaves ſmell nauſeous, fœtid; the Roots agree with Spikenard. *Spica Celtica* and the Flowers of Valerian agree well.

The Leaves of Wild Valerian boyled in Water yield a crude and fœtid Mucilage.

The Tincture of the Roots of Valerian, extracted with Spirit of Wine and Sal Armoniac, fines it much.

The Roots of Aſarum are Geniculate as Graſſes, and taſte very Acrid, Aromatic and Bitteriſh; 'tis called *Sylveſtre Nardum*, and for its ſimilitude referrible to it. The Antients attributed the ſame Virtue to *Aſarum* as to *Acorus*, but more intenſe and ſtrong.

Galen obſerved that *Phu* was an Odorate Root, like *Nardum* in virtue.

Pliny obſerved that Cyperus was a *Gladiolus bulboſa radice*, and like the Odor of *Nardum*.

The Decoction of *Aſcirum* was greeniſh, with a ſtrong ſmell of Spikenard, and Bitteriſh Acrid.

The Decoction of Valerian Roots of the ſame Taſte, but pale colour, and ſmell of Spikenard, but weaker; they ſeem to be of the ſame Claſs.

7. The Sweet, Fervid Acrid, Bitteriſh, and Aromatic like Orris in Taſte.

The Roots of Orris are Geniculate like Graſs.

The *Florentine* Roots are bitteriſh and ſweet, and of a burning Taſte.

The Water Flag is burning and ſtyptic, but of no ſmell; the Flowers of common Orris have an ill ſmell, tho the Roots be Aromatic. The whole Herb ſmells like Elder whilſt 'tis freſh bruiſed, but when dry 'tis Odorate; it gives a Rasberry Taſte to Drinks, and purges.

The great Galangal is Aromatic, Acrid, Burning and Bitteriſh; the Roots alſo geniculate, odorate; in form like Cyperus.

The Roots of Acorus are geniculate, acrid, burning, bitteriſh and aromatic; it reſembles Orris both in Leaves and Roots.

Ginger is acrid, burning and aromatic like Pepper; the Leaves are like *Iris Paluſtris*.

Zedoairy ſmells like Camphire, and is of a ſtrong Taſte, rather than ſweet, 'tis very bitter, and leſs acrid; but reſembles Ginger.

Coſtus is very burning, acrid and aromatic, and bitteriſh; it agrees with the vertue of Orris, both in its diſcuſſing quality and deobſtructing.

Coſtus Dulcis has a ſweet Taſte, and acrid; but the bitter has an ungrateful kind of Taſte; but there is but one ſpecies of *Coſtus*, the freſh is ſweet and white, the old is bitter and blackiſh.

Gladiolus has a bulboſe Root, ſweet, and moderately acrid or burning; and the Leaves are like Orris.

Xyrs is of an ungrateful fœtid odor, like Cimices; in form and figure like Orris.

Coſtus Arabicus is acrid, bitter and aromatic in Taſte.

The Roots of *Contrayerva* ſmell like Fig-leaves, are like Orris Roots in figure, they being chewed; taſte ſweet, aromatic and acrid, and have alſo an aſtringent Taſte.

Cardamomum has the Stalk and Leaves of a Reed, the Seeds in cods of a burning, acrid, bitteriſh, aromatic Taſte.

Amomum by its external figure and virtue agrees with *Cardamomum*; ſome reckon it like Acorus.

Grana Paradiſi are of a fœtid and aromatic Taſte, betwixt Cardamums and Pepper, and agrees with the ſame in vertue in Paralytic caſes.

The Grains of Paradice infuſed in Wine gives the odor of Quinces. *Salmon.*

The Roots of our yellow Flag are large and reddiſh; our Countrymen ſcrape them and pound them, then mix them with Milk, and give them twice to a Dog, as an infallible Medicine againſt the bite of a Mad Dog. A perſon who took them told me they did not purge, but taſted very rough. The Decoction is of a reddiſh colour, and rough.

8. The Sweet Mucilaginous Pea-taſtes, or Legumens.

I boyled *Vicia* ℥j in ℔j of Water to ℔ß, which taſted ſweet and crude ſtyptic, the colour was pale and greeniſh.

I boyled *Lens Paluſtris* in the ſame manner, and found the Decoction of a turbid colour, and reddiſh like Mum; it is a Legumen by this Intenſe Colour, as well as by the Taſte, which was Sweetiſh, Subacrid and Styptic. Note, that Snails and other Inſects are uſually mixt with it.

I boyled *Lagopus* in the ſame quantity as the other; the Taſte of the Decoction was ſtyptic, crude and bituminous.

The *Cortex Lentium* is ſtyptic and binding; the Seed of it mucilaginous and looſening; and this breeds an ill, flatulent and crude Juice, obſtructing the circulation of the Blood and Spirits, injurious to the Sight and Menſes; and by their flatulency producing turbulent Dreams.

The Leaves of Liquoriſh feel gummoſe, the Roots are ſweet and ſubacerbe.

Tamarinds are of an acid, acrid and ſweet mucilaginous Taſte; the Stones have the figure of Lupins, the Leaves of Tamarinds; are of an acid agreeable Taſte; and they muſt be referred to the Services and Berberries, tho by the Cods and Seeds I erroneouſly have claſs'd them with Caſſia or *Lupins*.

Fumaterry is ſubacrid, bitteriſh, mucilaginous, and legumen, tho the Flowers be not.

Radix Cava has bitter ſweet Roots like Beans, and a mealy ſubacrid Taſte; the Leaves have a crude ſmell like Fumiterry, and of the ſame virtue.

The Skin of the Bean is ſtyptic, but the fleſhy part bitteriſh leguminous.

Coffee is bitteriſh and of the Bean kind, in which there is a Volatile Salt, which raiſes the Spirits, and produces Urine and the Menſes.

Orobus is of an ingrateful bitteriſh Taſte; all the bitter Legumens open obſtructions and promote Urine, as Kidney Beans, &c.

I boyled Broom ℥j in Water ℔j to ℔ß, the Taſte was moderately bitter, ſweet and ſtyptic, not nauſeous, and without any heat.

I boyled of *Geniſta Spinoſa rootes* ℥j in ℔j of Water to ℔ß, the Colour was like Small Beer, the Taſte mucilaginous, ſtyptic, without any great bitteriſhneſs or acrimony; the Root taſtes bitteriſh, mucilaginous, ſtyptic; it may be proper for the Stone by thoſe Taſtes, and for Fluxes.

The Leaves of *Bruſcus* have the ſmell of Broom when bruiſed, and its bitteriſhneſs and ſtypticity and ſweetneſs, and are ſubacrid; and by this Taſte a Legumen.

Crato deſcribes Sena as if it had *Viſcidum quid*, by which it gripes; and by the Taſte he diſcovered the bitteriſhneſs and aſtriction. *Matthiolus* obſerved its viſcous Taſte and bitteriſhneſs, with a viroſe nauſeous odor, like *Cynogloſſe* or *Punica*. The ſiliquæ, as well as the ſweet taſte and flowers, prove it a legumen.

Polygala boyled with the Blue Flowers gave a Colour Blue like Violets, and the Taſte was very mucilaginous, the Plant is aromatic, acrid.

℥j of Violatri Color boyled in ℔j of Water to half, made a Decoction of a Greeniſh Colour, like Cowſlip Wine, and it taſted gratefully and mucilaginous; the Roots of *Polygala* are acrid and aromatic; it purges Bile.

The Decoction of the Root of *Periclymenum* is ſtyptic and bitter, and of ſweet leguminous Taſte.

Purple Trefoyle is mucilaginous and ſtyptic,by which it cools Feaveriſh heats, and by its burning acrimony it expels the putrid particles in Petechial Feavers and Fluxes.

The Leaves of Red Trefoyl rubbed ſmell acid, and the Flowers bruiſed ſmell like Woodbind. The Decoction of ℥j in ℔j of Water to half gave a Greeniſh Colour, pale; and the Taſte was of a crude mucilaginous leguminous Taſte, with an acrimony, by which 'tis a great Diuretic and Ophthalmic.

The Decoction of Purple Trefoyl has a turbid Colour, and mucilaginous Taſte.

The Leaves of *Periclymenum* are acid and acrid; the Flowers more ſweet, the ſtyle is of a Bean Taſte, and the Twigs of the ſame.

The *Stamina* have the Taſte of the Flower,and their Heads are very acrid.

Trifolium Fruticans is Bacciferous, with a Blue Juice, and tho it wants Cods 'tis a Legumen, as well as Periclymenum, which is bacciferous.

The Flowers of Aſparagus are hexapetali, and of an Herbaceous color; the Seed is a Pea, without a Cod, the Root is of a ſweet glutinous acrid Taſte; the tops of it boyled reſemble Peas Pottage, and are evidently of a Leguminous Taſte.

In the Legumens theſe are irregular, in Flowers or Cods, they are notwithſtanding certainly of that Claſs; by which we may infer, that the Taſte gives the moſt certain character of a Claſs.

The *Herba Mimoſa* has an Herbaceous odor, and a mucilaginous bitteriſh ingrateful Taſte; the Root is of a Taſte more grateful, without bitteriſhneſs, but of a violent ſmell like Garlick when firſt got, offending the Smell and Head, and is accounted a Poyſon. *Moriſon.*

Meſue obſerves that *Pſyllium* has contrary Virtues; 'tis of a mucilaginous, acrid and nauſeous Taſte: The *Medulla* is hot and exulcerating; the *Cortex* is moyſtening and cooling.

Goſſipium is a Plant like Linum, both in Leaves, Flower and Stalk.

There is a bitterneſs in *Linaria Morſon. Linaria* is by its Flower of the Leguminous Claſs,and probably Linum is of the ſame,tho the Flowers diſagree, being like it in Leaves.

Linſeed has the ſame virtue as Fennugreeke, which is a Legumen. The Leaves of Flax are gummoſe and bitteriſh, ſubacrid; the Flowers are *Pentapetali*, which differ from the Legumens.

I boyled ℥j of *Galega* in ℔j of Water to the half, the Color was pale, the Taſte nauſeous, bitter ſweet and mucilaginous, and the Odor nauſeous and fœtid.

The freſh Leaves of *Trifolium Aſphaltites* ſmells like Rue, when ripe like Bitumen.

The Decoction of *Ononis* was mucilaginous, ſubacrid, the Colour was Greeniſh.

The Leaves of *Conſolida Regalis* are of a crude ſmell, the Seeds are in Cods and Taſte leguminous. The whole Plant is of a diſagreeable Taſte.

Glaſtum and *Opiogloſſum* are of the ſame virtue, and *Luteola* is like them; place them here or with the Creſſes.

Thalictrum muſt be referred to the Docks both by its taſte and virtue.

Lignum Nephriticum is ſubacrid and bitteriſh.

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PHILOSOPHICAL TRANSACTIONS.

For the Months of July *and* Auguſt, 1702.

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II. *An Account of divers* Schemes *of* Arteries *and* Veins, *Diſſected from Adult* Human Bodies, *and given to the* Repoſitory *of the* Royal Society *by* John Evelyn, Eſq; *F. R. S. To which are ſubjoyn'd a Deſcription of the Extremities of* thoſe Veſſels, *and the manner the* Blood *is ſeen, by the* Microſcope, *to paſs from the* Arteries *to the* Veins *in* Quadrupeds *when living: With ſome* Chyrurgical *Obſervations and* Figures *after the Life, by* William Cowper, *F. R. S.*

III. *Part of two Letters to the Publiſher from Mr* James Cunningham, *F. R. S. and Phyſician to the* Engliſh *at* Chuſan *in* China, *giving an account of his Voyage thither, of the Iſland of* Chuſan, *of the ſeveral ſorts of* Tea, *of the Fiſhing, Agriculture of the* Chineſe, &c. *with ſeveral Obſervations not hitherto taken notice of.*

IV. *Part of a Letter from Mr* James Yonge *to Mr* John Haughton, *F. R. S. concerning the internal uſe of* Cantharides.

I. *Part of a Letter from Dr* Charles Leigh *of* Lancaſhire *to the Publiſher, giving an account of ſtrange Epileptick Fits.*

June 26. 1702.

WE have this Year had an epidemical Fever, attended with very ſurprizing Symptoms; in the beginning the Patient was frequently attacked with the *Colica Ventriculi*; Convulſions in various parts, ſometimes violent Vomitings and a Dyſentery; the Jaundice, and in many of them a ſuppreſſion of Urine; and what Urine was made, was highly ſaturated with Choler; About the ſtate of the Diſtemper, large Purple Spots appear'd, and on each ſide of 'em two large Bliſters, which continued 3 or 4 days; theſe Bliſters were ſo placed about the Spots, that they might in ſome meaſure be term'd Satellites or Tenders; of theſe, there were in many four different eruptions; but the moſt remarkable inſtance I ſaw in this Fever, was in a poor Boy of *Lymm* in *Cheſhire*, one *John Pownel*, about 13 years of Age, who was afflicted with the following Symptoms; upon the Criſis or turn of the Fever, he was ſeized with an *Aphonia*, and was ſpeechleſs 6 weeks, with the following Convulſions; the Diſtemper infeſted the Nerves of both Arms and Legs, which produc'd the *Chorea Sancti Viti*, or *St Vitus*'s Dance; the Legs ſometimes were both ſo contracted, that no perſon could reduce them to their natural poſition; beſides theſe, he had moſt terrible Symptoms, which begun in the following manner; he cou'd perceive the Fits to come on about the *Os-Sacrum* or extremity of the Back-bone, and the Region of the Navel, and then the diſorder, as he imagined, united about the top of his Head; he immediately afterwards fell into violent Convulſions in the Abdomen or loweſt Cavity, with that violence, that ſometimes two or three perſons were forced to lye upon him to keep him in Bed, his Body being frequently rais'd from it; after this, the Nerves of the Lungs were immediately affected, and then he barked in all the uſual notes of a Dog, ſometimes Snarling, Barking, and at the laſt howling like an Hound; after this, the Nerves of the Mandibles were convuls'd, and then the Jaws claſh'd together with that violence, that ſeveral of his Teeth were beaten out, and then at ſeveral times there came a great foam from his Mouth; afterwards he had an extream wild look, ſnatching at any thing near him, and would have tore off his Fleſh, had he not been prevented by the perſons about him; this made me conjecture he might formerly have been bit by a mad Dog, which had introduced the *Hydrophobia*; but I was convinced to the contrary, for I put a Baſon of Water by him, and he was not in the leaſt afraid of it, nor attempted to lap it. I ſaw him in three of theſe Fits, but at other times in theſe Convulſions, he roared like a Bull, made a noiſe like a Hog, and ſometimes like that of a Goſling; all which different ſounds, (I take it) proceed from the different contractions of the Lungs, variouſly forcing out the Air, and conſequently as they were differently convuls'd, form various ſounds; theſe Symptoms were ſo amazing, that ſeveral perſons about him believ'd he was poſſeſs'd: I told them there was no ground for ſuch Suppoſitions, but that the Diſtemper was natural, and a Species of an Epilepſy, and by the effects I convinc'd 'em of the truth of it; for in a weeks time I recover'd the Boy his Speech, his Sences return'd, his Convulſions vaniſh'd, and the Boy is now very cheerful: there have been other perſons in this Country much after the ſame manner: From this Caſe it is evident, that theſe Diſtempers are natural, ſince it cannot be imagined, that a Diabolical Spirit ſhould be ejected by a regular courſe in Phyſic, it makes it appear to be an impious Cheat, to amuſe the Populace with thoſe Artifices; and if a man be not Bigotted, this inſtance may ſufficiently convince him, how vain it is to pretend to thoſe needleſs Miracles.

We whoſe names are Subſcribed, do know this caſe relating to *John Pownel* to be true.

William Domvile, Eſq;	*John Pownell* the Patient,
Suſanna Domvile his Wife,	*Alice Pownell* his Mother,
Franck Pyott, Houſekeeper.	

II. *An Account of divers* Schemes *of* Arteries *and* Veins, *Diſſected from Adult* Human Bodies, *and given to the* Repoſitory *of the* Royal Society *by* John Evelyn, Eſq; *F. R. S. To which are ſubjoyn'd a Deſcription of the Extremities of* thoſe Veſſels, *and the manner the* Blood *is ſeen, by the* Microſcope, *to paſs from the* Arteries *to the* Veins *in* Quadrupeds *when living: With ſome* Chirurgical *Obſervations, and* Figures *after the Life, by* William Cowper, *F. R. S.*

THe Annext Figures of the *Arteries* and *Veins* (*i. e.* Fig. the 1ſt, 6th, and 8th,) were drawn after the Veſſels themſelves Paſted and dryed, which were Diſſected from *Adult Human Bodies*, and diſplay'd on *Tables* now to be ſeen in the *Repoſitory* of the *Royal Society*, and are the Generous Preſent of *John Evelyn*, Eſq; from whom I received the following *Letter*, concerning *them* and other *Tables* of the *Nerves*, &c.; to which I have ſubjoyn'd a further account, &c.

Vid. Act. Erud. pag. 2. Anno MDCLXXXII.

For Mr Cowper.

HEaring, Sir, that you are cauſing the Tables *of* Veins, Nerves, &c. (*which I ſome time ſince brought out of* Italy) *to be accurately delineated, in order to their being Ingraven, as more Correct than any that are yet to be found among the Figures of thoſe Veſſels in Books of Anatomy; and deſirous to underſtand how they came to my hands, I ſend you this little Hiſtory of them, for your ſatisfaction.*

Being ſome years ſince in Italy, *and Curious of ſeeing the many repeated Diſſections at the Anatomical Theatre at* Padoa, Cavalier Veſtlingius *being then Profeſſor, and Reading on divers Bodies ſeveral days, during the* Lent; *Dr* Johanno Athelſteinus Leoncenæ, *who was then* Operator, *by Extracting the Veins, and other Veſſels which contain the* Blood, Spirits, &c. *out of Humane Bodies, (which the many Hoſpitals and Infirmaries of that City plentifully afford) begun to apply, and diſtend them on* Tables, *according to their natural proportion and poſition, as an Improvement which might be of uſe in Anatomy: Some of theſe* Tables, *being finiſh'd, with the Direction and Public Approbation of the Profeſſor and ſeveral other Learn'd Phyſicians and Anatomiſts, preſent at thoſe Lectures and Operations; and underſtanding that* Leoncenæ *was going ſhortly (I think) into* Poland, *and willing to diſpoſe of his Tables, before he took his Journey; I deſir'd the late Dr* Geo. Rogers, (Conſul *then at* Padoa *for the Students of our Nation in that Univerſity) to purchaſe and procure them for me; which he did, for, as I remember,* 150 Scudi; *with Condition, that he ſhould add a* Table *more, namely, that of the* Liver, Gaſtrick Nerves *and other Veſſels, to compleat the Fourth: When theſe were perfected, I immediately ſent them to* Venice, *from whence they were ſhipp'd for* England*: But, upon what Accident or Occaſion I know not, the Veſſel was carried into* Holland, *and lay there a year or two, (without any tydings what was become of my Concerns, being then my ſelf at* Paris*) till coming at laſt to be unladen, Sir* Richard Ford *(afterwards Lord Mayor) finding by ſome Papers and Letters, with Directions on the Caſes, and ſeveral Bales of Books, and other things (which I had been collecting in* Italy, *that they belonged to me) took care to have them all ſafely convey'd to me at* London, *to my no ſmall charges. Dr* Scarborough *was one of the firſt I ſhew'd the*Tables *to; who would have tempted me to part with them for a very conſiderable ſumm, as I ſuppoſe, for my* Lord Marqueſs of Dorcheſter; *which I refuſing, he deſir'd I would lend them a little while to the Colledge; where he Read* *upon them, and kept them above a year, and thence return'd them to my Houſe at* Says-Court *near* Deptford ; *where they remained till the happy Reſtauration, when his Majeſty* Charles *the* II. *hearing of them, was pleas'd to come and ſee them himſelf with great ſatisfaction. The* Royal Society, *for the promotement of Natural, and Experimental Knowledge, being a little after Inſtituted and Founded by that Curious Prince, and meeting at* Greſham *Colledge, I made a Preſent of my* Tables *to the* Repoſitory.

J. Evelyn.

Theſe * Figures are cloſely Drawn after the Original Schemes, and I am apt to flatter my ſelf they will be acceptable to the Inquiſitive. It is ſome ſatisfaction that I find the *Arteries* here ſo agreeable to a Figure which I Drew and Publiſhed not long ſince, from the *Arteries* of a *Fœtus* Injected with Wax. But this Figure of the *Veins* differs ſo much from any extant, as would incline one to ſuſpect all of the ſubject hitherto publiſhed are Fictitious, not excepting even thoſe of *Veſalius.* But firſt of the *Arteries.*

* *Fig. 1ſt, 6th and 8th.*

That the *Arteries* are the Veſſels which convey Blood from the *Heart* to all parts of the Body, is well known ; and we ſee by Fig. the 1ſt that the common practice of Nature in diſtributing theſe Veſſels, to ſupply the parts with Blood, is from the next adjacent Trunk, till their Aſcending and Deſcending Trunks become Conical, as well as their collateral Branches : Not that all the Trunks and Ramifications of *Arteries* are Uniform, and become Conical in the ſame manner ; nor do all of *Them* paſs directly to the parts to which *They* convey Blood ; nor do all parts receive *Arteries* from their neighbouring Trunks.

The Trunks of the *Carotid, Vertebral* and *Splenick Arteries* are not only *Contorted* in their progreſs, in the *Adult* ; but the *Diameters* of their bores are variouſly *Dilated* in divers parts of *Them,* eſpecially where *They* are *Contorted* ;

but as theſe Dilatations of their Trunks are caus'd by the reſiſtance the Blood meets with at thoſe *Angles of Inflection*; ſo thoſe *Enlargements* of them afterwards contribute to retard the protruſion of the Blood to the Extremities of thoſe *Arteries:* Hence it is, That as the *Arteries* of the *Fœtus* are not *Contorted* in ſuch Acute Angles as in full grown Bodies, ſo their Trunks are more Conical, and not here and there dilated in divers parts of them, as in the *Adult.*

The Trunk of the *Splenick Artery* has a ſtraight progreſs in the *Fœtus* and in *Infants*; but in the *Adult* I have hitherto conſtantly found it very much *Contorted*, as expreſt in Fig. 1, 23.

The peculiar Contrivances of the *Spermatick Arteries* of *Quadrupeds* as well as *Men*, ſhew a Conſtant deſign in Nature of taking off that Velocity with which the Blood would otherwiſe paſs thro the *Glands* of the *Teſtes*: It ſeems to be for this end that the *Teſtes* of moſt Animals (eſpecially *Men* and *Quadrupeds*) hang out of the Cavities of their *Abdomens*, that the canals of their Blood Veſſels may be lengthened: for the *Spermatick Arteries* (contrary to all others) ariſe from their Great Trunk, at a far greater diſtance from the *Teſtes* than the *Arteries* of any other part of the Body. Nor would the *Teſtes* (which are ſuch neceſſary Organs) been thus expoſed to external Injuries, if the end of Nature in lengthening their Blood Veſſels had not been very conſiderable. Beſides this lengthening of the *Spermatick Arteries*, we find Nature ſtill contriving other Impediments to *check* the Current of the Blood in thoſe Parts; it ſeems for this end that the *Spermatick Arteries* are leſſen'd at their Original from the Trunk of *Arteria Magna* in *Men*, and that the *Spermatick Arteries* of *Quadrupeds* are ſo much *Contorted* before they reach their *Teſtes.*

The principal Inducement of Nature in making uſe of theſe different Contrivances in the *Spermatick Arteries* of *Men* and *Quadrupeds* ſeems to be, That if the *Humane Spermatick Arteries* were Contorted, as in *Quadrupeds*, before they reach their *Teſtes*, the Apertures in the *Abdominal Muſcles* of *Man* muſt be much larger than they now are, and would frequently let the *Inteſtines* deſcend into the *Scrotum*; which we know nevertheleſs often happens: ſuch *Ruptures* (as they are call'd) are not ſo Incident to *Quadrupeds*, tho the Paſſages for their *Spermatick* Veſſels (through their *Abdominal Muſcles*) are much wider than in *Men*, becauſe the poſition of the Trunks of their Bodies is *Horizontal*, and their Inteſtines therefore cannot preſs on the proceſſes of the *Peritonæum*, as in *Men* who are *Erect*.

Beſides theſe *Artifices* in diſpoſing the Trunks of *Arteries*, I doubt not but much more will be Detected by the Inquiſitive: In the mean time, I ſhall, at preſent, purſue the Thread, and deſcribe the Extremities of the *Arteries*, with their *Communications* with the *Veins*, and afterwards produce ſome Inſtances of the Art of Nature in conveying the Refluent-Blood to the *Heart*.

After the *Circulation of the Blood* through the Heart, Lungs, and large Blood Veſſels, was demonſtrated by *Dr Harvey*, it was only gueſt how the extremities of the *Arteries* tranſmitted the Blood to the *Veins*, till Mr *Lewenhoeck*'s *Microſcopes* had diſcovered the continuations of the Extremities of thoſe Veſſels in *Fiſh*, *Frogs*, &c. which is now commonly ſhewn by *Microſcopes* made by other * *Hands*: Yet there are not wanting *thoſe* who doubt of the like Continuations of the Extremities of *Arteries* and *Veins* in *Human Bodies* and *Quadrupeds*; ſince thoſe *Animals* it has hitherto been ſeen in (to any ſatisfaction, as *Mr Lewenhoeck* confeſſes) have been either ſuch *Fiſh*, or of the *Amphibious kind*, that have but *One Ventricle* in their Hearts, and their Blood actually cold, except in Bats, in which it appears very obſcurely: Add to this, that the Blood in thoſe Creatures does not Circulate with ſuch Rapidity as in *Animals* whoſe Hearts have *Two Ventricles*. For all Ani-

See the following Tranſactions.

mals, that have *Biventrous Hearts*, the Veſſels of the reſt of the Body return their Blood to the Heart in equal time and quantity with thoſe of the Lungs, notwithſtanding the Inequality of their Courſe.

* This Difference in the principal Organs of the *Circulation of the Blood* in thoſe Creatures, (on which only theſe *Experiments* have been hitherto made) mov'd me to make ſome, on *Animals* whoſe Organs differ only from the *Humane* in their groſs Figure, and not in their Intimate Structure: For this end I took a young *Cat*, about ten or twelve days old, and faſtened it to a Board as in Viveſection; and making an Inciſion through the *Linea Alba*, the *Omentum* and Inteſtines were extruded; then cauſing the Creature to be ſo held (on the Board) under a large *Double Microſcope*, where a flat Glaſs for receiving of Objects was placed Horizontally, on which I expanded the *Omentum* or Caul, (a Light being placed underneath) I ſaw the Globules of the Blood move very ſwiftly in the ſmall Veſſels, which are only to be ſeen in the moſt *Tranſparent* parts of the *Membranes* of its *Omentum*; but the motion of the Blood ſoon abated, and its Globules were withdrawn from the Extremities of its Blood Veſſels; and in a little time became ſtagnant in their larger Branches.

This appearance of the continuation of the Extremities of the *Arteries* with the *Veins*, while the Blood was moving in them, in the *Omentum* or Caul, is expreſt by Fig. 4. A A ſhews the Trunks of the *Arteries*, B B the *Veins*, which were diſtinguiſhable by contrary currents of the Globules of the Blood in each Veſſel. C C C ſhews the Branching of the Extremities of the *Arteries* and *Veins*, that no longer Aſſociate with each other, but are United, as here expreſt. After I had ſeen this, I attempted to ſhew the like to ſeveral *Friends*, but did not always ſucceed ſo well as when Mr *Chamber's* and Mr *Buckeridge* favoured me with their preſence, at a time when I happened to have a young lean Dog, that was not large; in whoſe *Omentum* we

* Mr Wotton in his Reflections upon Antient and Modern Learning, *Chap. xviii. Since it has been conſtantly found, that Nature follows like methods in all ſorts of Animals, where ſhe uſes the ſame Inſtruments, it will always be believed, that the Blood Circulates in Men after the ſame manner as it does in* Eels, Perches, Bats, *and ſome other Creatures, in which Monſieur* Leeuwenhoek *tried it. Though the ways how it may be viſible to the Eye in Men, have not, that I know of, been yet diſcovered.*

we ſaw it very well; but by the Aſſiſtance of an Inſtrument I had prepar'd to expand the *Meſentery*, we all ſaw it there much better; that part having not only larger and clearer ſpaces than the *Omentum*, but its Blood Veſſels are diſtributed more regular, as appears by Fig. the 5th, where the ſame Letters of reference ſerve as above.

Thoſe who will entertain themſelves in viewing the tranſparent parts of Living Creatures with *Microſcopes*, will find that the extremities of their *Arteries* and *Veins* are not all equally leſſen'd, tho united. In the Tail of the *Lacerta Aquatica*, *Tadpols*, and in moſt Fiſh (I have examin'd) I have frequently obſerv'd ſeveral Communications between the *Arteries* and *Veins*; in which more than two Globules of Blood have paſt abreaſt: And in the ſame *Area* I have ſeen ſome of thoſe *Communications* ſo ſmall, as that but one Globule could paſs, and that very ſlowly before the other. In young *Fiſh*, particularly in Grigs, I have frequently obſerv'd a *Communicant Branch*, ſo very ſmall as that one Globule of Blood only has paſt it in two or three ſeconds of a minute: at other times I have found conſiderable Intervals in paſſing of one Globule in ſuch a Communicant Branch; even half a minute, a whole minute, and once in two or three minutes I have ſeen one Globule of Blood only paſs in a particular tract.

The prompt paſſing of Liquors, injected by the *Splenick Arteries*, to the *Veins*, ſhews the Communications between thoſe Veſſels are more open than the *Arteries* and *Veins* of other parts, of which I have elſewhere ſpoken.

Liquors alſo Injected into the *Pulmonick Arteries* paſs to their *Veins*, tho not altogether ſo freely as in the *Spleen*.

On viewing the Extremities of the *Pulmonick* Blood-Veſſels in a living Frog with my *Microſcope*, I found their *Communications* much larger than *thoſe* that I had before ſeen in the Membrane between the Toes and in the Feet of the ſame Creature. Nor can we reaſonably doubt of the like patent Communications of the *Arteries* and *Veins* of

Humane Lungs and thoſe of *Quadrupeds*, when we conſider the *Blood* of their Lungs muſt return to the Heart in equal *Time* and *Quantity*, with *that* of all the parts of the Body beſides, as before noted. Hence it appears the Bronchial Blood Veſſels (firſt taken notice of by the Accurate *Ruyſch*) are abſolutely neceſſary, elſe the parts of the Lungs could not receive nouriſhment; nor could the Glands of the *Bronchiæ* ſeparate their Liquor, if they were ſupplied with *Blood* from the Pulmonick Blood Veſſels *which* is ſo quickly diſpatched thro the Lungs.

On viewing the Membrane, that is between the Toes of one of the hinder Feet of a living Frog, after I had frequently taken hold of the ſame Leg of that Creature, to apply it to the Microſcope, I found that Membrane very tranſparent, and without any motion of the Globules of the Blood in it, as if the part had been dead; but while I was looking on it, it was, I confeſs, not a little entertaining to ſee the Globules creep into it by degrees, and at length the Blood move in all the Branches of its *Veins* and *Arteries* as before, when no violence had been offered to the part: While the Blood is thus leiſurely creeping through the the Veſſels, you may plainly ſee its Globules compreſt into Oval Figures, which are made more or leſs oblong, by the reſiſtance thoſe Globules meet with, by the contraction of the ſides of the Veſſels they paſs through; and this I have more than once obſerved in the tails of the Water *Newts* or *Lizzards*: But on examining the Blood of theſe Creatures with a Microſcope, and comparing it with the Humane Blood, I found the Globules of the *Lizzards* Blood more incline to an oval Figure, and were as big again as the Globules of Humane Blood, and that of a ſmall Fiſh; which I in like manner viewed at the ſame time. It is not unlikely a ſudden retroceſſion of Blood from the extremities of its Veſſels often happens, and its *Circulation* in the ſame Veſſels, is afterwards carried on without any impediment; as on ſome Paſſions of the

Mind, Deliquiums by the effuſion of Blood, or otherwiſe. But if the Blood is once become ſtagnant in its Veſſels (eſpecially the *Arteries*) the part is in no ſmall danger of a Mortification, unleſs its neighbouring Veſſels, which enjoy the motion of the Blood, drive on the ſtagnant Blood, and it eſcape by the ſides of the Veſſels that retain'd it. Experience aſſures us, that in Bruiſes when the Blood is extravaſſated, it goes off either by *Tranſcolation* or elſe cauſes an *Abſceſs*; for there's little reaſon (in my opinion) to ſuſpect any of the ſtagnant Globules of the Blood will be fit to re-unite with the *Circulating* Maſs. But that the Blood after ſtagnation in its Veſſels will ſometimes paſs their ſides, appear'd to me from the following Experiment.

On viewing the *Meſentery* of a Dog when living, in which I had before ſeen the Blood paſſing the extremities of the *Arteries* and *Veins*, I conſider'd how to preſerve the Blood in its Veſſels, that I might afterwards at any time ſee it in their Extremities when ſtagnant: For this end I caus'd ſeveral parts of the *Meſentery* to be tyed on as many pieces of ſmall round *Pill-Boxes*, cut tranſverſely like little hoops; on which, *Portions* of the *Meſentery* were extended like the head of a *Drum*; and on viewing *them* afterwards with my *Microſcope*, I found the Extremities and Branches of the Blood Veſſels charged with Blood, which before appeared in Motion; ſome of which *parts* of the *Meſentery* I ſtill keep by me. On laying one of theſe *Parts* of the *Meſentery* (thus expanded) in Water, the ſtagnant Blood in its Veſſels diſappear'd; but on juſt immerſing another of thoſe *Pieces* in Water, I could with my Naked Eye ſee the ſtagnant Blood diffuſed in the Interſtices of the Blood Veſſels, and between the Membranes of the *Meſentery*: Hence it's evident, the Blood may paſs the ſides of its *Veſſels* after ſtagnation in '*em*; but whither its *Globules* are broken, or what figure renders *them* fit to paſs thoſe pores that are in the ſides of the Veſſels, I leave to the Inquiſitive; but we muſt return to our *Tables*, and firſt of that of the *Syſtem* of the *Vena Cava*.

As the *Arteries* are known to export the Blood, ſo the *Veins* carry it back again to the *Heart*; but having already deſcribed their Extremities, we come next to the large Trunks of the Veins; and here, as in the *Arteries*, we find the common practice of *Nature*, in diſpoſing the Branches of *Veins* to diſcharge the Refluent Blood into the next adjacent Trunk, and ſo on to the Heart. As the *Arteries* afford abundance of Inſtances of *Checks* given to the Velocity of the Current of the *Blood* through ſeveral parts, ſo the *Veins* ſupply us with as many *Artifices* to aſſiſt its regular return to the *Heart*, as well as favour thoſe *Contrivances* in the *Arteries*.

The Trunks of the *Carotid*, *Vertebral* and *Splenick Arteries* are not only variouſly Contorted, but are alſo here and there *Dilated*; ſo the *Veins* that correſpond to thoſe *Arteries* are alſo variouſly *Dilated*. The beginnings of the Internal *Jugulars* have a *Bulbous* cavity (Fig. 7. H, H,) which are *Diverticuli* to the Refluent Blood in the *Sinus's* of the *Dura Mater*, leſt it ſhould deſcend too faſt into the Jugulars. The like has been alſo taken notice of by Dr *Lower* in the *Vertebral Sinus's*. The *Splenick Vein* has divers *Cells* opening into it near its Extremities in Human Bodies; but in Quadrupeds the *Cells* open into the Trunks of their *Spleenick* Veins.

The *Spermatick* Veins do more than equal the Length of the *Arteries* of the *Teſtes* in *Men*; their various *Diviſions* and ſeveral *Inoſculations* and their Valves,are admirably contriv'd to ſuſpend the Weight of the Blood, in order to diſcharge it into the larger Trunks of the *Veins*; and were it not that the Refluent Blood from the *Teſtes* is a *Pondus* to the Influent Blood from the *Arteries*, and ſtill leſſens its current in the *Teſtes*; theſe Spermatick Veins, like *thoſe* of other parts, might have diſcharged their Blood into the next adjacent Trunk.

Who can avoid ſurprize at the Art of Nature, in contriving the *Veins* that bring part of the Refluent Blood from the lower parts of the Body? when they conſider the neceſſity of placing the Human Heart, as well as that of moſt Quadrupeds, ſo far from the *Center* of the Body towards its upper part? It is for that end neceſſary the large Trunks of the *Veins* and *Arteries* ſhould not aſſociate each other; for if all the Blood ſent to the lower parts, by the Deſcending Trunk of the *Aorta*, ſhould return to the Heart again by one ſingle Trunk (as it is ſent out from thence) the *Weight* of ſo much Blood in the Aſcending Trunk of the *Vena Cava*, (Fig. 6. C, C, A) (for ſo its lower Trunk is call'd) would oppoſe the force the Heart could give it from the Arteries, and hinder its aſcent: For this reaſon the *Vena Azygos* (Fig. 6, b) or *ſine pari*, is contriv'd to convey the Blood ſent to the Muſcles of the Back and *Thorax* into the Deſcending Trunk of the *Vena Cava* (ib. B. A.) above the Heart: Hence it's evident, more Blood comes into the Heart by the Deſcending, or upper Trunk of the *Vena Cava*, Fig. ib. B, A. than paſſes out by the Aſcending Trunks of the *Aorta*. Nor does this quantity of Blood convey'd to the Heart by the *Superior Trunk* of the *Cava*, ſeem without ſome other deſign in Nature, beſides Tranſporting it thither to free the *Inferiour Trunk* from its Weight: But perhaps it was neceſſary ſo much Blood ſhould be ready there to joyn with the Chyle, (Fig. 6. †) for its better Mixture, before it reaches the Right Auricle of the Heart.

Vid. Lower de Corde, cap. 1. pag. 1.

I might here add the Deſcription of a *Peculiar Valve* I lately diſcovered in the *Lower Trunk* of the *Vena Cava*, near the Right Auricle of the Heart; but the Annext Figures have taken up too much room in theſe Copper Plates to inſert it: For the ſame reaſon, the Figures of ſome Contrivances in the *Arteries* here mention'd, particularly the *Spermaticks*, are omitted: This being what occurr'd to my Thoughts at preſent on this ſubject, which is not to be found (at leaſt not commonly) in the Books of *Anatomy*: The greateſt part of which have been added to theſe Papers, on their lying by me ſince the *Graver* began the Figures.

The Explications of the Figures.

Fig. 1.

REpreſents the Trunks and large Branches of the *Arteries*, Diſſected from an *Adult Human Body*, when diſplayed and dryed; as they are now to be ſeen in the *Repoſitory* of the *Royal Society*.

1. The Trunk of the *Aorta* cut from the *Baſis* of the Heart.

2. That part of it, whence the Coronary Artery of the Heart does ariſe.

3. That part of the *Arteria Magna*, where the *Canalis Arterioſus* of the *Fœtus* Terminates; which in an *Adult* becomes a Ligament. Vid. Fig. 2, 3.

4. 4. That part of the *Axillary-Arteries*, by ſome called the *Subclavian Arteries*.

5. The Left *Carotid Artery* (in this ſubject it ſeems) ariſing from a Common Trunk with the Right *Carotid* and *Axillary Arteries*, as in ſome Quadrupeds.

6. The Left *Cervical* Artery, in this ſubject ariſing from the Trunk of the *Arteria Magna*, as expreſt in a Figure given by *Bergerus* in the *Acta Eruditorum An.* 1698. pag. 295. But in all the Human Bodies in which I have hitherto Examined theſe *Arteries*, I have conſtantly found *them* as expreſt Fig. 2. 6. 6.

7. The *Arteries* that carry Blood to the lower parts of the Face, Tongue, Adjacent Muſcles and Glands.

8. The Trunk of the *Temporal Artery*, ſpringing from the Carotid, and parting with branches to the Parotid Gland 9, and Temples 10, and parts Adjacent.

11. The *Occiputal Arteries*.

12. The *Arteries* that convey Blood to the *Fauces Gargareon* and Adjacent Muſcles.

13. The Trunk of the *Carotid Artery* cut off, before it is *Contorted* in paſſing the Skull.

14. The Trunk of the *Artery* of the Arm parting with Branches to the Adjacent Muſcles and Parts.

* That part of this *Artery* which is ſometimes prickt in Letting Blood, and makes an *Aneuriſma*, in which caſe this Trunk of the Artery muſt be bared and *firmly tyed above* the *Aneuriſma*; and if it afterwards happens (as it has been frequently known) that the flux of Blood to the *Aneuriſma* in the *Artery* is not very much abated, tho the *Artery* has been *tyed above*: The *Operator* in that Caſe muſt make another Ligature on the Trunk of the *Artery below* its *Aneuriſma*: Theſe Collateral Communications of the Trunk of the Artery at the bending of the Cubit, preſerve the Circulation of the Blood in the Cubit and Hand, tho the *Trunk* is totally compreſt both *above* and *below*; and the ſame *Trunk* afterwards divided between thoſe Ligatures. Hence it is, if one Ligature made above the wound in the Artery is not ſufficient, but the Blood ſtill pours out from below, the *Patient* will ſooner recover the Action and Strength of the Muſcles of the Cubit, than Thoſe in whom the upper Ligature proves ſufficient; the reaſon of which is obvious to any who conſider that the *Communicant Branches* muſt be larger where the lower Ligature is required, then when the ſuperior Ligature only is ſufficient: Theſe *Communicant Branches* (as I have ſeen them in ſome ſubjects) are here markt out in prickt Lines, *vid.* the Fig.

While theſe Papers were lying by me, the two following Inſtances happen'd, in which the *Communications* of the large Trunks of the *Arteries* of the Cubit and Arm were remarkable. The firſt was

A *Boy* of thirteen years, who, about three weeks before I ſaw him, receiv'd a Wound near the middle of the *Cubit* in which the *Trunk* of the *Artery* (markt in the Fig. †.)

was divided. The *Surgeon* who was firſt call'd had frequently bound up the Wound, and put a ſtop to the ſeveral diſcharges of Blood (which they told me did not amount to leſs than 6 or 7 quarts at times) but not without a Compreſs on the Trunk of the *Artery* above the wound. On another impetuous Flux I was called; but ſeeing no ſmall quantity of Blood diſcharged, I was contented to let the Wound be bound up, in the ſame manner as it had been done before; omitting the Compreſs on the Trunk of the *Artery* above, and adding a piece of Deal-board, on which the Hand and Cubit were faſtened, to prevent any Motions of thoſe parts, as well as the Fingers: Three days after, the applications were taken off, and little or no Blood appear'd; but two or three hours were ſcarce elapſed e're I was alarm'd with notice of a freſh Flux. The *By-ſtanders* being inſtructed in that caſe, to compreſs the *Trunk* of the *Artery* above the *Cubit*, *they* had thereby prevented no ſmall effuſion of Blood, which muſt otherwiſe have happen'd: His *Surgeon* being out of the way, I laid the Trunk of the Artery bare above the Wound as expeditiouſly as I could, being forced more than once to let looſe the compreſs above to diſcover its Orifice by the Flux of Blood. I paſſed a *Needle* with ſtrong Waxed Thread under the Artery, and made a ligature on its Trunk, which lay concealed in the Interſtice of the *Muſculus Flexor Digitorum*, and the *Muſculus Vlnaris Flexor Carpi*;) but notwithſtanding this Ligature on the Trunk of the Artery above the Wound, the Blood ſtill flow'd from the *Lower Trunk* of of the *Divided Artery*, yet the velocity of its Current was ſo much abated, that it ſeem'd like Blood flowing from a Vein. I left the Wound with a digeſtive, and the part without hard bandage, it being now five weeks ſince, I hear the Wound is almoſt *Cicatriz'd*. The Learned Dr *Harris* was preſent at the other *Operation*, by which the *Communications* of the large Trunks of the Arteries of the Arm were very evident.

A *Boy* about eight years of Age, who came to Town with an *Aneuriſma* of the Left Arm, upon Bleeding 6 weeks before. The *Tumour* was indeed very large in proportion to ſo ſmall an Arm. After laying the *Aneuriſma* or *Tumour* bare, and making a Ligature on the *Superior* Trunk of the *Artery* (in the annext Fig.* .....) I found, on looſning the *Compreſs* on the ſuperior Trunk of the Artery, very little abatement of the *Pulſation* of the *Aneuriſma*; I then paſſed a Ligature in like manner on the Trunk of the Artery below the Tumour; but notwithſtanding, the *Pulſation* continued, tho much abated. I then diſcovered another Trunk of the *Artery*, ariſing from the lower part of the *Tumor*, on which alſo I made another Ligature, and the Pulſation was then taken off. However, on cutting off the ſurface of the *Cyſtis* or dilated *Artery*, and clearing it of the coagulated Blood, there ſtill poured out ſome freſh Blood, which was ſoon ſtopt with a common aſtringent; I left the part without any other Ligature or hard Bandage. It is now eighteen days ſince the *Operation*, the *Ligatures* on the *Arteries* are all come off, and the *Pulſation* of the *Artery* of the *Wriſt* begins to be very manifeſt, nor does any Symptom appear that threatens ſucceſs.

15. The diviſion of the Trunk of the Artery of the Arm below the Flexure at the Cubit.

16. The external Artery of the Cubit, which makes the *Pulſe*, that is commonly felt near the *Carpus*.

17. The Arteries of the Hand and Fingers.

18. The Mammary Artery.

19. 19. The deſcending Trunk of the *Arteria magna*.

20. 20. The Intercoſtal Arteries.

21. The *Arteria Cæliaca*.

22. The *Arteria Hepatica*.

23. The Trunk of the *Arteria Splenica*.

24. The *Arteria Epiploica Siniſtra*.

25. A Branch of an Artery which paſſes to the bottom of the Stomach.

26. The ſuperior Coronary branch of the Stomach.

27. 27. The ſuperior Meſenterick Artery.

28. 28. The emulgent Arteries.

29. The inferior Meſenterick Artery.

30. 30. The Lumbal Arteries.

31. 31. The two Spermatick Arteries, which in this ſubject, ſeem to ariſe at a greater diſtance from each other than commonly.

32. The Iliack Artery.

33. The *Arteria Sacra.*

34. The Internal Iliack Branch.

35. The External ———

36. The Epigaſtrick Artery.

37. Branches of the External Iliack Artery, paſſing to the Oblique Muſcles of the *Abdomen.*

38 38. The Arteries that paſs to the Muſcles of the Thigh and *Tibia.*

39. The Crural Artery.

40. The Umbilical Artery, with thoſe of the *Penis.*

41. That part of the Crural Trunk that paſſes the Ham.

42. The three Trunks of the Arteries of the Leg.

43. The Arteries of the Foot and Toes.

FIG. 2.

THe Trunks and ſome of the Ramications of the Arteries of an adult Human Body fill'd with Wax, to ſhew the Variety in Nature, and ſupply the defects of the former Figure.

1. The *Aorta* cut off at the *Baſis* of the Heart.

A. The three Semilunary Valves as they appear when the Heart is in *Diaſtole*, and hinder the Blood coming back from the Arteries into the Left Ventricle of the Heart.

B. A Portion of the Trunk of the *Arteria Pulmonalis.* b, b. its diviſion before it paſſes to the right and left Lobes of the Lungs.

C. The deſcending Trunk of the *Arteria Magna.*

D. D. The

DD. The Internal Mammary Arteries.

2 The Trunk of the Coronary; cut off.

3 The *Ligamentum Arterioſum*, which in the *Fœtus* is the *Canalis Arterioſus*, and conveys Blood from the Pulmonick Artery to the Great Artery.

4. The Trunk of the Subclavian Artery.

5. 5. The Carotids.

6. 6. The Vertebrals.

7. 7. The Arteries which paſs to the lower parts of the Face, Tongue, Adjacent Muſcles and Glands.

8. 8. The Trunks of the Temporal Arteries ariſing from the Carotids, giving Branches to the Parotid Glands (9. 9) and the Temples (10. 10.) *&c.*

11. 11. The Occiputal Arteries.

12. The Arteries of the *Fauces*, *Gargareon*, *&c.*

13. 13. The Contortions of the Carotid Arteries, as they paſs the *Baſis* of the Skull: Theſe Trunks of the Carotid Arteries in Dogs (like thoſe I gueſs of moſt Quadrupeds) are very much Contorted before they reach the *Baſis* of the Skull: on filling theſe Veſſels of that Animal with Wax, I found thoſe Branches of *them* which paſs to the Brain, firſt clipping the hinder parts of the lower Jaw, immediately under its Condiloide Proceſſes; where thoſe Arteries are received in two *Sinus's* of that Bone, which *Sinus's* may alſo be ſeen in the Jaw-bones of other Quadrupeds, but not in Human Bodies.

14. 14. Thoſe parts of their Trunks that paſs by each ſide of the *Sella Turcica*, whence divers ſmall Branches ariſe, and help to compoſe the *Rete Mirabile*; which is more conſpicuous in Quadrupeds than in Human Bodies.

15. 15. The Contortions of the Vertebral Arteries, where we find their Trunks conſiderably dilated.

16. The Vertebral Arteries, as they aſcend on the *Medulla Oblongata* towards the Annular Protuberance or *Pons Varoli*.

17. 17. The Communicant Branches of the *Vertebral* and *Carotid* Arteries.

18. 18. The Arteries of the Brain diſplayed.

FIG. 3.

I Chooſe to place this Figure on the *Copper Plate* of one of the Trunks of the Arteries of the *Tibia* (diſſected from the Leg after *Amputation*) rather than the following *Diſtich*, which I find written on the *Original Table* of this Scheme of the *Arteries*.

Pulſificus Sanguis de Cordis Ventre ſiniſtro,
Funditur ut Corpus nutriat hiſce vijs.

Before I explain the Letters of Reference of this 3d Figure, it will be neceſſary to let you know that Mr *Stringer* was in his ſixty ſeventh year when this Artery was taken from him, and near twenty years before loſt the uſe of both his *Legs*; and in that time he had been ſo perſecuted with Convulſions in *them*, that neither Leg was free a quarter of an hour together, whether Sleeping or Waking. At length one of his little Toes mortified, which was taken off by Mr *Goldwyer*, an *Expert Surgeon* of *Salisbury*; not long after more Toes of the ſame Foot followed the like fate: The Convulſions following that Leg ſtronger and quicker: That part of the Foot next the Toes became tumid and inflam'd, the Tumor extending itſelf above the *Maleoli*: A Sinuous Ulcer paſſed by the ſide of one of the *Metatarſal Bones*; the extremity of which Bone (whence the Toe was taken off) lying bare. In this condition I found the Left Foot and Leg of this *Gentleman*, when I had the Honour to wait on him by Command of the *Right Honourable* the preſent *Earl of Shaftsbury*, he living in the Neighbourhood of that *Noble Peer* in *Wiltſhire*; where I met with *Mr Goldwyer* above-mention'd; and finding the Leg very chilly, the neceſſity of parting with it was too evident;

which Mr *Stringer* ſuffer'd with extraordinary Fortitude, *He* not ſo much as expreſſing the leaſt Outcry during the *Operation*, tho the part did not want the moſt exquiſite ſenſe of feeling: On the Abſciſion (which was about five or ſix Inches below the Knee) it was unexpected, by me, I muſt confeſs, to ſee ſo little Blood ſpouting from the *Arteries*. The Stump being bound up, and committed to the Hands of two or three Servants, a leſs number not being ſufficient to hold it, by reaſon ſuch ſtrong Convulſive motions purſued the part on the Operation. I was very deſirous to examin the *Arteries* of the Amputated Leg, having before diſcovered the Cauſe of a Mortification of the Arm of a *Young Gentlewoman*, who dy'd not long after an Amputation of the part, tho the *Gangreen* did not appear to reach near the place where the Abſciſion was made: (*i. e.* below the ending of the *Muſculus Deltoides*) In which *Caſe*, I found the ſides of the Trunk of the *Artery* of the Arm ſo thickn'd, that the *Diameter* of its *Bore* was *Contracted* to leſs than a third part, and would ſcarce admit a Common Probe to paſs it, *vid.* Fig. G. H. I. When I had found the ends of the *Arteries* in the Leg above-mention'd, I endeavour'd to paſs my Probe into one of *them*, but meeting with ſome oppoſition, I ſuſpected I had miſtaken the *Vein* for the *Artery*, and that the Valves oppoſed the paſſing of the Probe that way; but on further diſſection I clear'd the Trunks of both thoſe Blood Veſſels, and found the *Veins* in their Natural ſtate; but the ſides of the *Arteries* were grown *Bony* or *Stony*; having clear'd two of *their Trunks*, I left one of *them* at *Salisbury*, the *other* I brought to Town, and is here Figur'd.

A The Upper part of the Artery cut off in the Amputation of the Leg; from A to

B The Trunk of the Artery diſtended and dry'd to ſhew its Canal.

C That part of the Trunk of the Artery which was ſo contracted by the Petrifaction or Oſſification, that a Probe would not paſs its Canal; From C to

D The Trunk of the Artery opened and expanded.

E E The Petrifications or Oſſifications in the ſides of the Artery.

F F Their ſpecks in the lower part of the Artery, not ſo large as in the upper part, and placed at greater diſtances.

a a *&c.* The Branches ariſing from the Trunk of the Artery.

G, A Portion of the Trunk of the Artery of the Arm above-mention'd.

H The ſides of the Artery very much thickned, whereby the *Diameter* of its *Canalis* was ſo Diminiſhed that the Probe

I, would not paſs it.

The *Oſſifications* in the Coats of *Arteries* have been frequently Obſerv'd, eſpecially in their large Trunks within the Cavities of the *Thorax* and *Abdomen*; but I don't remember the like has been taken notice of in the Limbs; or that ſuch impediments in their Canals have been found the Cauſe of Mortifications of particular parts, as in the Inſtance abovemention'd; tho I doubt not, but the like has often happen'd in Aged people, eſpecially where we find the progreſs of the Gangreen not very ſwift, and its beginning from no external *Cauſe*; the Conſequences of which are commonly found Fatal. When the Arteries of one Leg (or of any other Limb) are ſo affected, we may well ſuſpect the like in *thoſe* of other parts; which probably happened in the Inſtance I now mention'd; for tho no Gangreen came on the ſtump, yet the other Foot and Toes began to Mortifie about 6 weeks after the Amputation, as did the parts about the Hips, which were Compreſt in Laying or Sitting, before he expir'd.

FIG. 4.

Repreſents the Extremities of the Blood Veſſels, as they appear while the Blood is paſſing them in the *Omentum* of a live Dog, view'd with a *Microſcope*.

A A The

A A The Branches of Arteries, and B. B the Veins which Aſſociate. C C their leſſer Branches where they paſs from each other, and are United at their extremities.

FIG. 5.

The like appearing in the *Meſentery* of a Dog when living.

D, D, The *Areæ*, that are here viewed with the Microſcope, as they appear to the naked Eye.

FIG. 6.

The Trunks of the *Vena Cava*, with their Branches Diſſected from an Adult Humane Body, done from the Original Scheme in the *Repoſitory* of the *Royal Society*.

A A The Orifice of the *Vena Cava*, as it appears when cut from the Right Auricle of the Heart.

a The Orifice of the Coronary Vein of the Heart.

B. A. The *Superior*, or *Deſcending Trunk* of the *Vena Cava*.

C, C, A, The *Inferior* or *Aſcending Trunk*; ſo diſtinguiſhed from the motion of the Blood in theſe Trunks, which is contrary to their Poſition.

D D, The Subclavian Veins.

†. That part of the Left Subclavian Vein, where the *Thoracick Duct* enters it, and diſcharges itſelf of its *Chyle* and *Lympha*.

b, The *Vena Azygos* with its Branches going to the Ribs, e, e.

c. The Superior Intercoſtal Veins.

d, d, The Internal Mammary Veins.

E, E, The Right and Left Iliack Branches.

F, F, The Internal Jugular Veins.

G, G, The External Jugulars.

H, H, The Veins which bring Blood from the lower Jaw and its Muſcles.

I, I, The Trunks of the Internal Jugulars cut off at the *Baſis* of the Skull.

f, The Veins of the *Thymus* and *Mediaſtinum*.

g, g, The Veins of the Thyroid Glands.
h, The *Vena Sacra.*
i, The Internal Iliack Branch.
k, The External———
K, K, The Occipital Veins.
L, The Right Axillary Vein.
M, The Cephalick.
N, The Baſilick.
O, The Median Vein.
P, The Trunk of the Veins of the Liver.
Q, The Phrenick Vein of the Left ſide.
R, The Right Phrenick Vein.
r A large Vein from the left *Glandula Renalis* and parts adjacent.
S, The Left Emulgent Vein.
T The Right Emulgent, in this ſubject very much lower than the Left, which is not uſual.
V V The two Spermatick Veins.
X X Two Communicant Branches between the Aſcending Trunk of the *Vena Cava* and *Vena Azygos*, by which the Wind paſſes into the Deſcending Trunk of the *Cava*, when we blow into the Aſcending at A. P C. tho the Trunk at A. P. and C. is firmly tyed on the Blow-pipe.
* An uncommon Branch between the lower Trunk of the *Vena Cava* and the Left Emulgent Vein.
y A Vein which brings Blood from the Muſcles of the *Abdomen* into the external Iliack Branch.
z The Epigaſtrick Vein of the Right ſide.
1 The *Vena Saphena.*

The reſt of the Branches here diſplayed commonly differ ſo much in various ſubjects, that the particular deſcriptions of them (which none but the *Operator* who diſſected them could pretend to be maſter of) would be perhaps as uſeleſs, as tedious to repeat: Wherefore I paſs to thoſe conſiderable venous Trunks *which* are wanting in this *Scheme.*

FIG. 7.

SOme of the large Trunks of the Veins and their *Sinus's* within the Skull, with the Beginnings of the Internal Jugular Veins, filled with Wax and dryed together with the *Falx*, *&c.*

A The extremity of the *Falx* cut from the *Criſta Galli.*

a Its lower *Limbus* that touched the *Corpus Calloſum*, as it divides the Right Hæmiſphere of the Brain from the left; where the Fifth *Sinus* paſſes, which is here dryed and diſappears.

B. B. The ſecond *proceſs* of the *Dura Mater*, which ſupported the hindmoſt parts of the Lobes of the Brain, and defended the *Cerebellum* from being preſt by thoſe parts of the *Cerebrum.*

C A portion of the *Dura Mater* remaining to the Longitudinal *Sinus*.

D. D. Several Trunks of the Veins of the Brain cut off before they enter the Longitudinal *Sinus*.

E E The Longitudinal *Sinus's.*

F F The two lateral *Sinus's.*

G The fourth *Sinus.*

g The Veins from the *Plexus Choroides.*

H H The *Bulbi* or *Diverticuli* at the beginnings of the Internal Jugular Veins.

I I The Internal Jugular Veins.

K K The Trunks of Veins, which bring Blood from the lower Jaw and parts adjacent.

FIG. 8.

THe Trunks of the *Vena Portæ* diſſected and diſplayed; done from the Original Scheme in the *Repoſitory* of the *Royal Society.*

A A The Branches of the *Vena Portæ* freed from the Liver.

a The Umbilical Vein.

B The Splenick Branch.

C C The Meſenterick Branches which are continued from the Inteſtines.

b. The Trunk of the *Vena Pancreatica*, which receives Branches alſo from the *Duodenum.*

c. c. The *Vena Gaſtrica dextra Coronaria Superior.*

D The Superior Coronary Vein of the Stomach of the Left Side.

E The Inferior Coronary Branch of the Stomach of the Right Side, and

F The ſame Coronary Vein of the Left Side removed from their proper ſcituations; from theſe two laſt are continued the *Vena Epiploica Superior dextra* 1, and the *Siniſtra* 2, with the *Media* 3.

G The Vein call'd *Vas Breve.*

d The *Vena Duodeni.*

H The *Vena Hæmorroidalis* ariſing from the *Rectum* and *Anus*, in this ſubject emptying itſelf into the left Meſenterick Branch; but in other Bodies (and particularly in a preparation of theſe Veins, which I have now by me) I find this Trunk of the *Hæmorroide* Veins ending in the *Ramus Splenicus.*

The length of the Trunk of this Hæmorroide Vein, and its progreſs under the *Inteſtines*, renders it liable to be compreſs'd, and its Refluent Blood retarded; whence its Branches in the *Inteſtinum Rectum* and *Anus* become diſtended with Blood, and cauſe the *Hæmorroides Cæcæ* and *Apertæ*; *which* are frequently attended with *Apoſthumations* in the *Anus* and parts adjacent; which diſorders are the more incident, not only becauſe theſe Hæmorroide Veins (like the reſt of the Branches of the *Vena Portæ*) are without *Valves*, and the Blood has an Aſcending progreſs in *them*, together that the long Trunk (H) is not only expoſed to the Compreſſions made by the *Inteſtines* in both Sexes: But particularly the *Uterus* in *Women* in time of *Geſtation*, eſpecially near the Birth, ſo Compreſſes this *Trunk*, that it's no wonder we find Women

more

Fig 2.

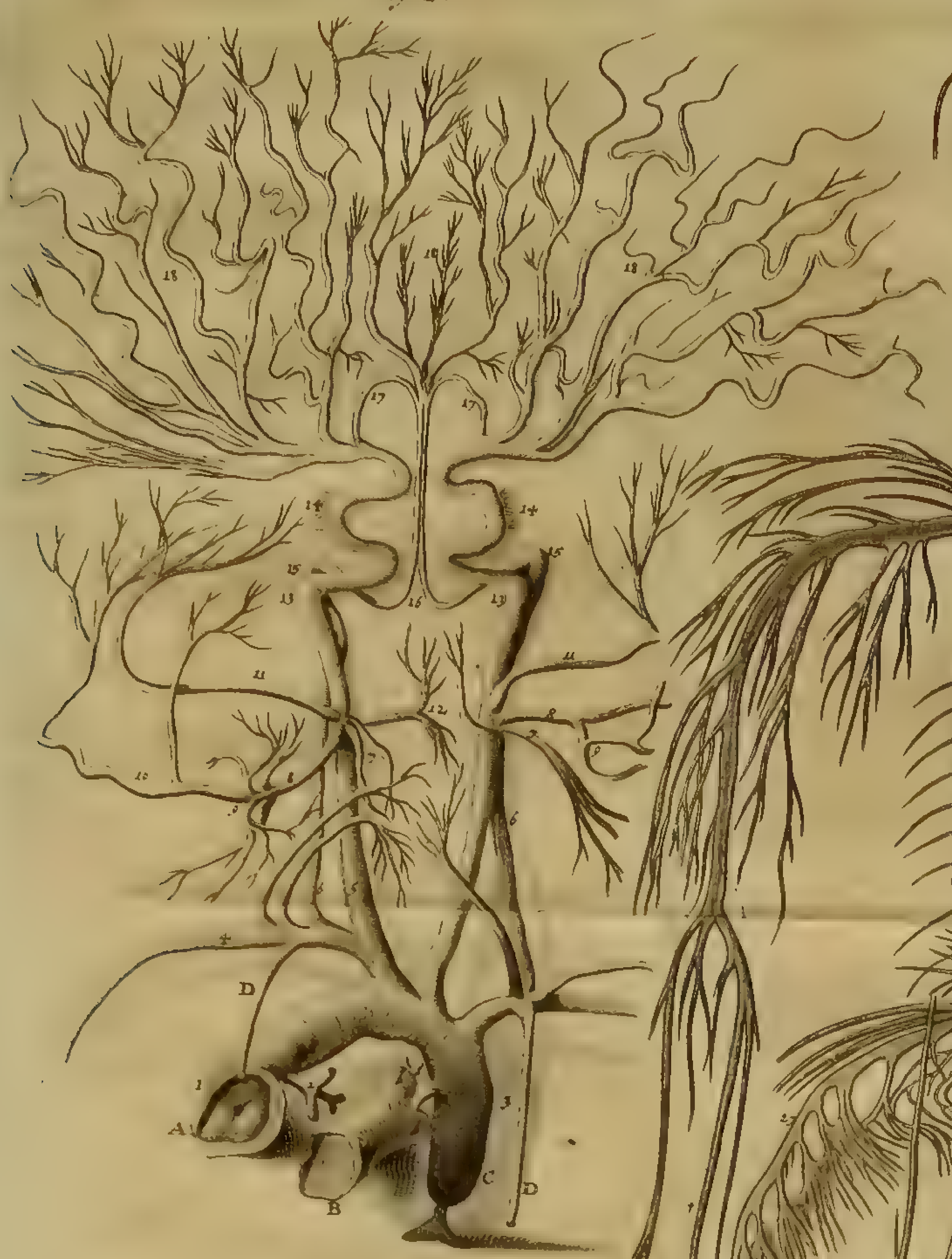


Fig 1.

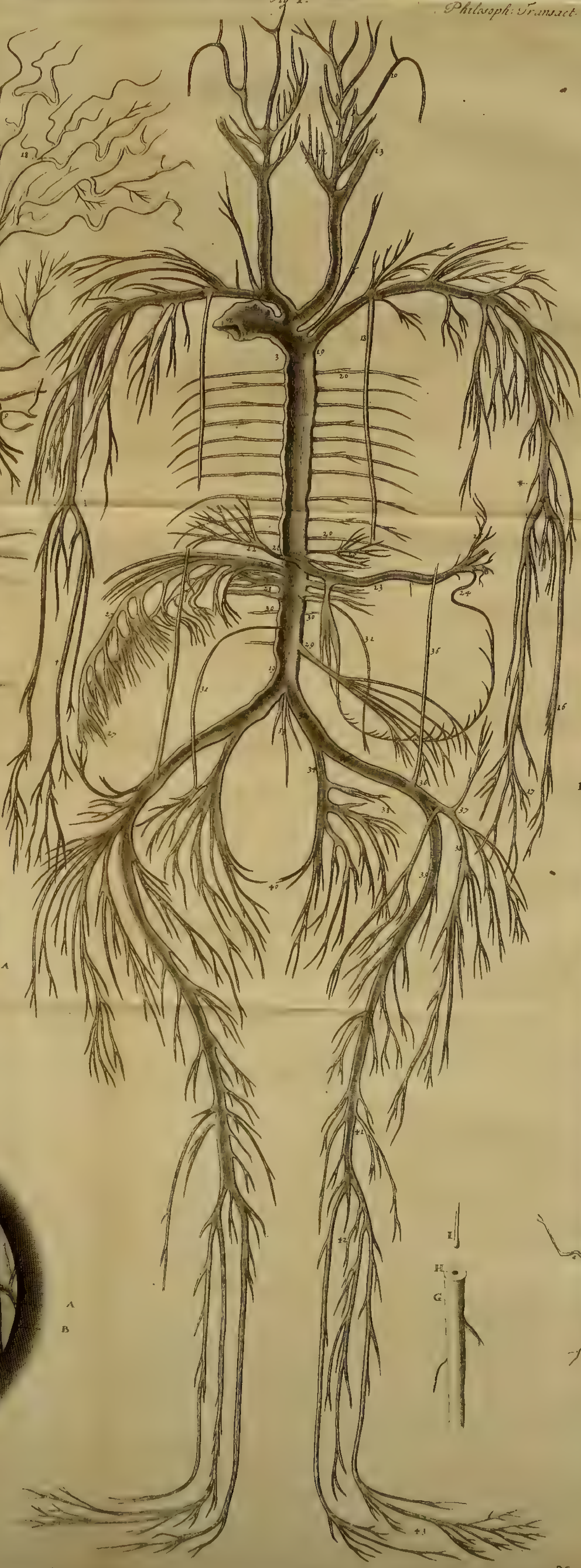
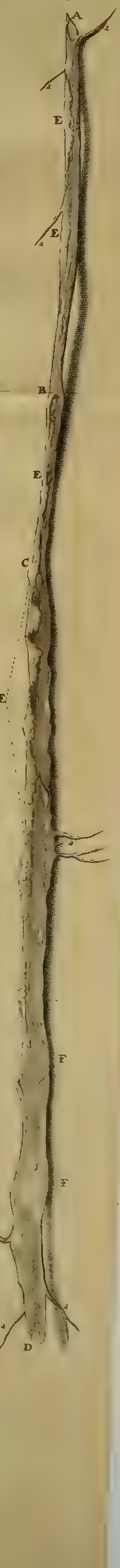


Fig: 3.



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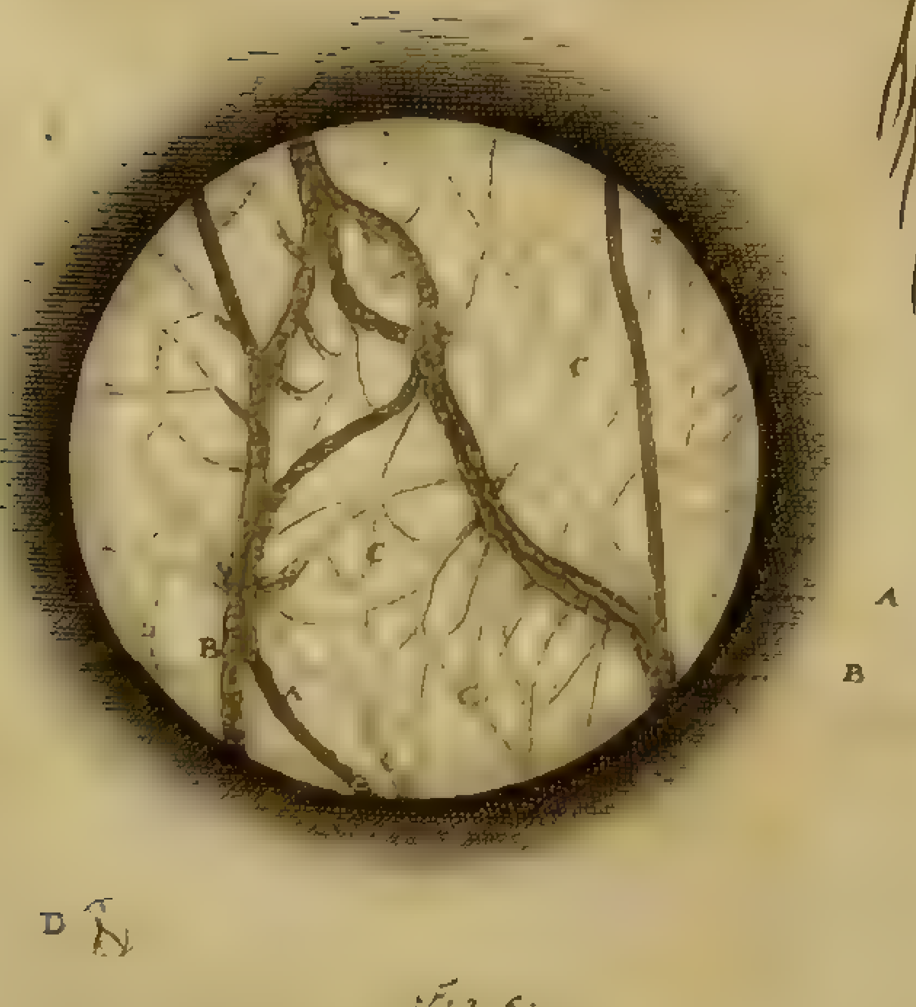
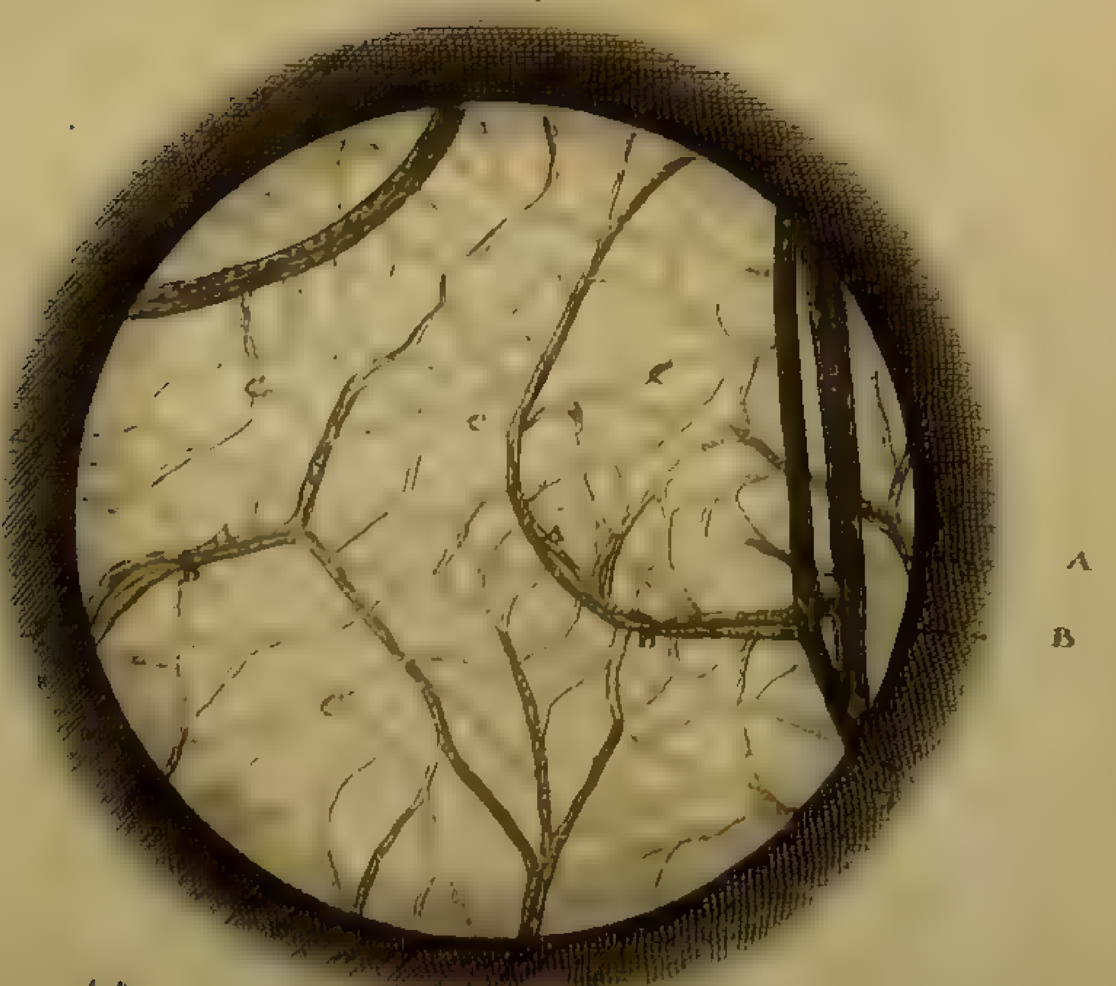
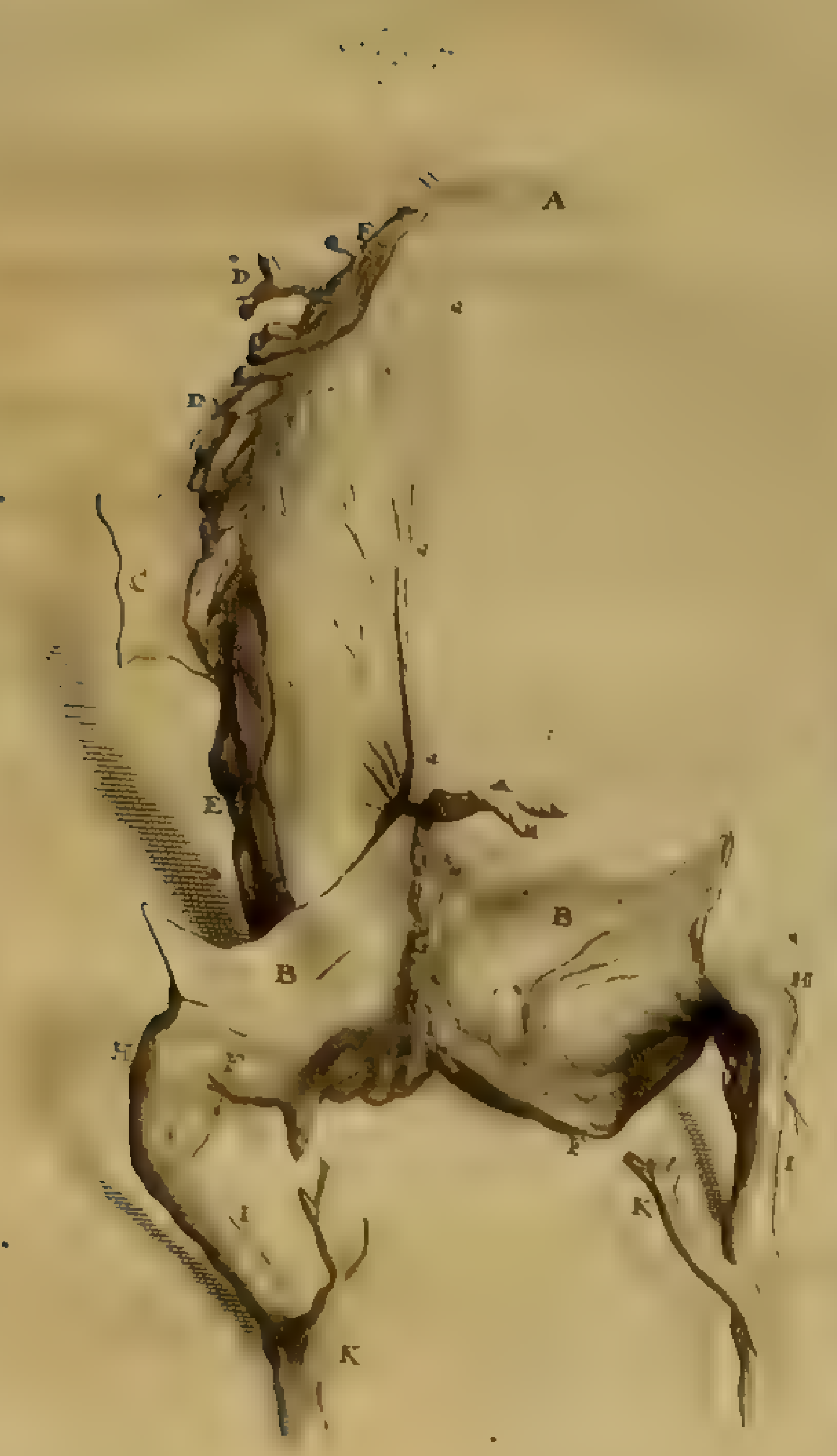


Fig 5.



M. V.d Gucht Sculp:



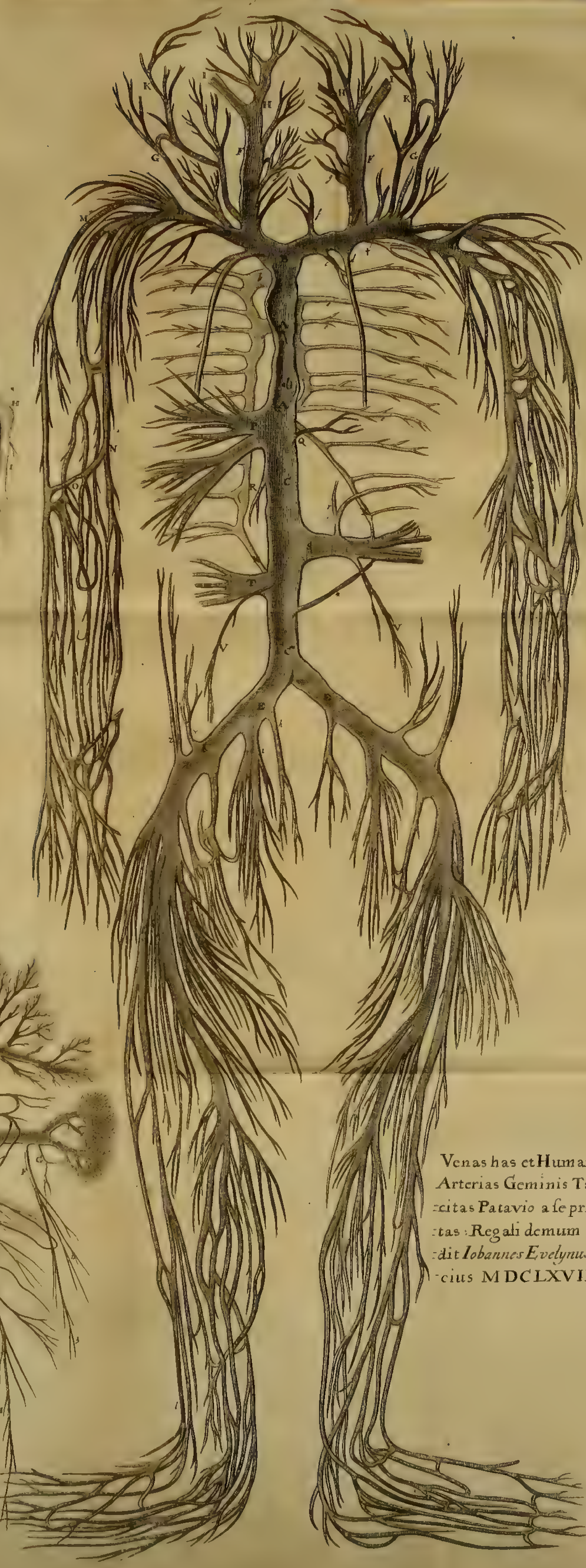


Fig. 9.

Venas has et Humani Corporis Arterias Geminis Tabulis adplicitas Patavio a ſe pridem deductas: Regali demum Societati dedit *Iohannes Evelynus* ejuſdem Socius MDCLXVII.

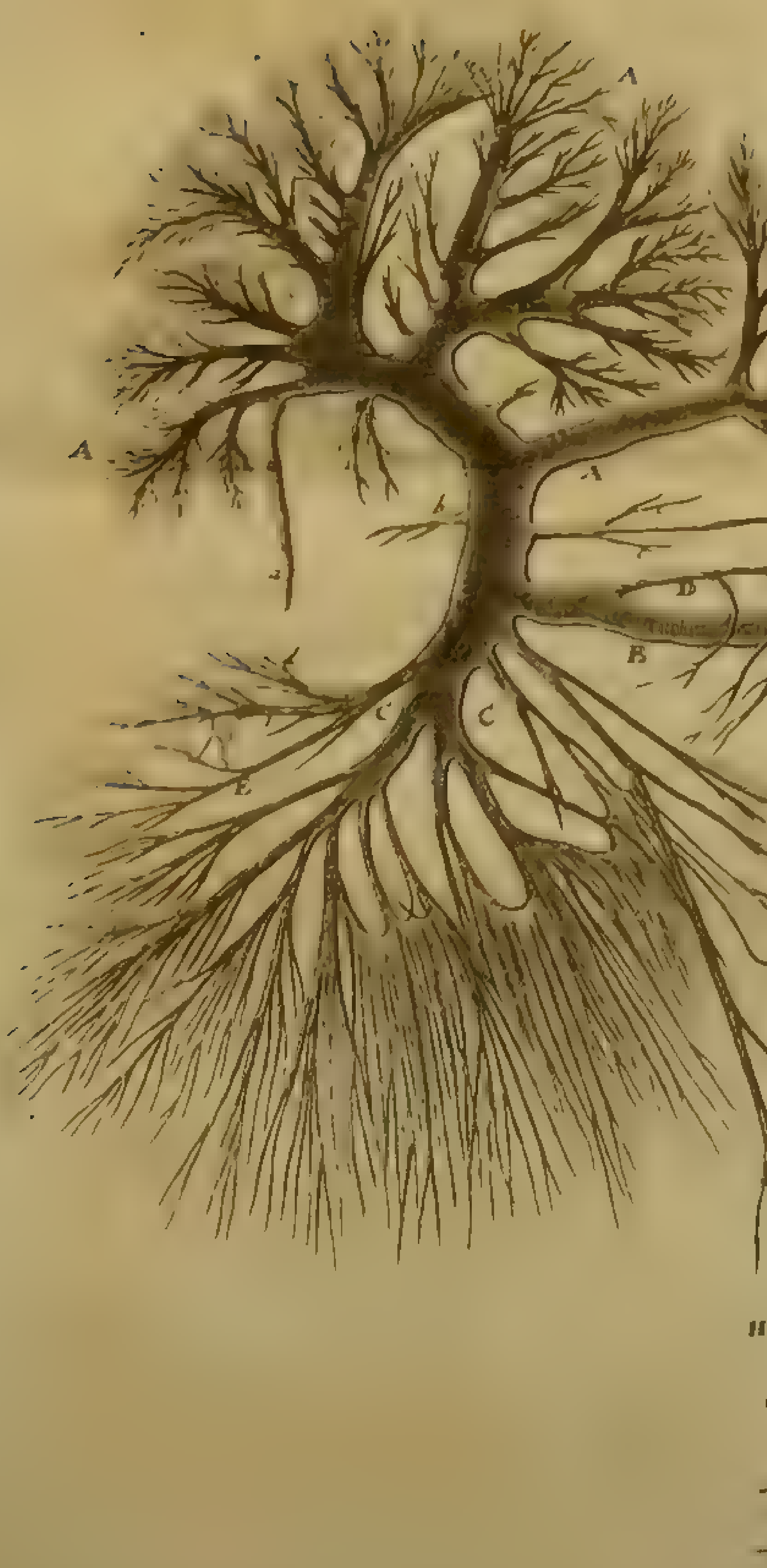


Fig 8.

M: vd Gucht Sculp:

BRITISH MUSEUM NATURAL HISTORY

more afflicted with the *Hæmorroides* at that *time*, than at any other. Nor are the *Iliac* Veins and the *Lympheduct* that accompany *them*, without being expoſed to the like Incumbrance in Women with Child, whence the Veins of the Legs and Thighs become *Varicoſe*, and thoſe Limbs are ſo frequently ſwoln; which, in a late inſtance I was acquainted with, when the Intumeſcence proved ſo great, that at length the Abdominal Teguments were vaſtly extended; but the *Gentlewoman* recovered (beyond the expectation of ſome) on the happy *Delivery* of two large Children.

III. *Part of two Letters to the Publiſher from Mr* James Cunningham, *F. R. S. and Phyſician to the* Engliſh *at* Chuſan *in* China, *giving an account of his Voyage thither, of the Iſland of* Chuſan, *of the ſeveral ſorts of Tea, of the Fiſhing, Agriculture of the* Chineſe, &c. *with ſeveral Obſervations not hitherto taken notice of.*

S I R,

MY laſt to you was from the Iſland of *Borneo*, in which I gave you an account of our arrival there the 17th of *July*, where we ſtaid but 2 days, the Seaſon of the year being ſo far paſt, and from thence made the beſt of our way through the Streights of *Banca* with favourable Winds and Weather, till we came on the Coaſt of *China* the 13th of *Auguſt*, then we had variable Winds which carried us abreſt of *Emuy* the 19th following, at which time the North Eaſt Winds ſetting in freſh, put us in great fears of loſing our paſſage; whereupon we were forced to turn it up againſt Wind and Current all the way, the Weather ſo favouring us, that we were never but by our Topſails, elſe we ſhould have loſt more Ground in one day, than we

could

could have gain'd in eight. The laſt of *Auguſt* we came to an Anchor under the *Crocodile* Iſlands, both to ſhelter us from the bad Weather, (which is generally expected on this Coaſt at new and full Moon, and has been fatal to a great many Ships) and alſo to look for freſh Water, which was now grown ſcarce with us, not having recruited ſince we came from the Cape of *Good Hope*: Theſe are 3 ſmall Iſlands lying in the Latitude of 26 Degrees, about 6 Leagues from the River of *Hockſieu*; on *two* whereof we found very good freſh Water, with a convenient Watering-place on the South Weſt ſide of the innermoſt of the *three*; and by the aſſiſtance of a few *Chineſe* Fiſher-men we procured ſome freſh Proviſions from the main-land, becauſe we did not reckon it ſafe to adventure our ſelves thither, leſt we ſhould have been brought into trouble by the Government there. While we lay here, on the 5th of *September* we had a ſudden ſhort ſhift of the Monſoon to S. W. the fury whereof others felt, in coming upon the Coaſt of *China* at the ſame time. The 8th of *September* we put to Sea again, turning to Windward night and day without all the Iſlands, which are very numerous along this Coaſt, to which we were altogether ſtrangers beyond *Emuy*, and the Hydrography thereof is hitherto ſo imperfect, that there was no truſting to our Drafts, which made our Navigation ſomewhat more dangerous: However, on the firſt of *October* we got into the Latitude of 30 Degrees, where we came to an Anchor near the Land, until we found the way by Boat to *Chuſan*, about 12 leagues within the Iſlands; from whence we had a Pilot, who carry'd us ſafely thither on the 11th of *October*. Upon this Iſland the *Chineſes* have granted us a Settlement and Liberty of Trade, but not to *Ning-po*, which is 6 or 8 hours ſail to the Weſtward, all the way amongſt Iſlands; this being the largeſt, is 8 or 9 leagues in length from Eaſt to Weſt, and 4 or 5 leagues in breadth; about 3 leagues from that point of the Main-Land called Cape *Liampo* by the *Portugueſe*, but *Khi-tu* by the *Chineſe* : At the Weſt end of this Iſland is the Harbour, very ſafe and convenient, where the Ships ride within call of the Factory, which is built cloſe by the ſhore on a low plain Valley, with near 200 Houſes about it for the benefit of Trade ; inhabited by Men, whoſe Jealouſie has not as yet permitted them to let their Wives dwell here ; for the Town where they are, is ¾ of a mile further from the Shore, environ'd with a fine Stone Wall, about 3 miles in Circumference, mounted with 22 ſquare Baſtions placed at irregular diſtances, beſides 4 great Gates, on which are planted a few old Iron Guns, ſeldom or never uſed : the Houſes within are very meanly built : Here the *Chumpeen* or Goververnour of the Iſland lives, and betwixt 3 and 4 thouſand beggarly Inhabitants, moſt part Souldiers and Fiſhermen ; for the Trade of this place being newly granted, has not as yet brought any conſiderable Merchants hither. The Iſland in general abounds with all ſorts of Proviſions, ſuch as Cows, Buffelo's, Goats, Deer, Hogs wild and tame, Geeſe, Ducks and Hens ; Rice, Wheat, Calavances, Coleworts, Turnips, Potatoes, Carrots, Beetes and Spinach ; But for Merchandize there's none but what comes from *Ning-po*, *Hang-cheu*, *Nankin* and the Inland Towns, ſome of which I hope to ſee, when I have acquir'd a little of the *Chineſe* Language. Here alſo the Tea grows in great plenty on the tops of the Hills, but it is not in that eſteem with what grows on more Mountainous Iſlands. Altho this Iſland is pretty well ſtor'd with People, yet it's far from what it was in *F. Martinius*'s time, when he deſcribes *Cheuxan* : and this puts me in mind, that the Superſtitious Pilgrimages thereto, mention'd by him, muſt be meant of the Iſland *Pou-to*, which lyes 9 leagues from hence, and 3 miles to the Eaſtward of this Iſland, whither (they ſay) the Emperour deſigns in the month of *May* next (being his Birth-day, and the 40th year of his Age) to come to worſhip in an Ancient Pagod there, famous for Sanctity ; having ſent one of his *Bonzes* already thither, to get all things in order.

Chu-

Chuſan, Novemb. 22. 1701.

SIR,

I Formerly told you, that the Emperor deſign'd to have come to the Iſland of *Pou-to* (a place of great Devotion) to worſhip in the month of *May* laſt, being the 40th year of his Age, I ſhould have ſaid of his Reign; but all things being prepared there for his reception, he was diſſuaded from his purpoſe by ſome of his *Mandarins*, who made him believe that the terrible Thunder there was very dangerous. This *Pou-to* is a ſmall Iſland about 5 leagues round at the Eaſt end of this Iſland, famous for the ſuperſtitious Pilgrimages made thither for the ſpace of eleven hundred years: it's inhabited only by *Bonzes*, to the number of 3000, all of the ſect call'd *Hoſhang*, or unmarried *Bonzes*, who live a *Pythagorean* life; and there they have built 400 Pagodes, two whereof are conſiderable for their Greatneſs and Finery, being lately covered with green and yellow Tiles brought from the Emperor's Palace at *Nankin*, and inwardly adorn'd with ſtately Idols finely grav'd and gilded, the chief whereof is the Idol *Quon-em*. To theſe two great Pagodes belong two chief Prieſts, who govern all the reſt. They have ſeveral Ways and Avenues cut through the Iſland, ſome whereof are pav'd with Flagſtones, and overſhaded with Trees planted on each ſide: their Dwellings are the beſt I have yet ſeen in theſe parts. All which are maintain'd by Charitable Devotions; and the Junks which go from *Ning-po* and this place to *Japan*, touch there both going and coming, to make their Offerings for their good ſucceſs. There is another Iſland call'd *Kimtong* 5 leagues hence in the way to *Ning-po*, whither, they ſay, do retire a great many *Mandarins* to live a quiet life after they have given over their Employments; on that Iſland alſo are ſaid to be Silver Mines, but prohibited to be open'd. The reſt of the circumjacent Iſlands are either deſert, or meanly inhabited by a few fiſhing people, but all of them ſtor'd with abundance of Deer. For it is not long ſince this Iſland of *Chuſan* began to be peopled; it's true, in *Martini*'s days, about 50 years ago, it was very populous for the ſpace of 3 or 4 years, at which time the fury of the *Tartarian* Conqueſt was ſo great, that they left it deſolate, not ſparing ſo much as the Mulberry Trees (for then they made a great deal of raw Silk here) and in this condition it continued till about 18 years ago, that the Walls of the Fort or Town, which now is, were built by the Governour of *Ting-hai*, for a Garriſon to expel ſome Pyrates, who had taken ſhelter here. About 14 years ago, the Iſland beginning to be peopled, there was a *Chumpeen* or General ſent to govern it for 3 years, to whom ſucceeded the late *Chumpeen* (who procur'd the opening of this Port to ſtrangers) whoſe Government continued till *April* laſt, being tranſlated to be *Chumpeen* of *Tien-cing Wei* near to *Pekin*, and was ſucceded by the preſent *Chumpeen* who is Son to the old *Chunkoon* of *Emuy*.

They have got no Arts or Manufactories here, but making of lacker'd Ware, a particular account whereof I cannot as yet ſend you. They begin to plant Mulberry-Trees, to breed up Worms for the production of Raw Silk; and they make ſome Tea, but chiefly for their own uſe.

Altho the following particulars contain nothing of extraordinary matters in them, yet ſuch as they are, you may take, till I can procure you better.

The 3 ſorts of Tea commonly carry'd to *England* are all from the ſame Plant, only the Seaſon of the year, and the Soil makes the difference. The *Bohe* (or *Voiii*, ſo call'd of ſome Mountains in the Province of *Fokien*, where it is chiefly made) is the very firſt bud gather'd, in the beginning of *March*, and dry'd in the ſhade. The *Bing* Tea is the ſecond growth in *April*: and *Singlo* the laſt in *May* and *June*, both dry'd a little in *Tatches* or Pans over the Fire. The Tea Shrub being an ever-green, is in Flower from *October* to *January*, and the Seed is ripe in *September* and *October* following, ſo that one may gather both Flowers and Seed at the ſame time; but for one freſh and full Seed, there are a hundred nought; theſe make up the 2. ſorts of Fruit in *Le Compte's* deſcription of Tea: as for his other ſort, which he calls ſlymic Peaſe, they were nothing but the young Buds of the Flowers not yet open. Its Seed-Veſſels are really *Tricapſular*, each *Capſula* containing one Nut or Seed, and altho two or one *Capſula* only comes to perfection, yet the Veſtiges of the reſt may be diſcerned. It grows in a dry gravelly ſoil, on the ſides of Hills in ſeveral places of this Iſland, without any cultivation.

Le Compte is miſtaken in ſaying (pag. 96.) that the *Chineſes* are wholly Strangers to the art of Grafting, for I have ſeen a great many of his Paradoxical Tallow-Trees ingrafted here, beſides ſome other Trees. When they ingraft, they do not ſlit the Stock as we do, but cut a ſmall ſlice off the outſide of the Stock, to which they apply the graft (being cut ſloping on one ſide, agreeable to the ſlice cut from the Stock) bringing up the Bark of the ſlice upon the outſide of the Graft, they tye all together, covering with Straw and Mud as we do.

The Commentator on *Magalhen* ſeems doubtful in the length of the *Chineſe Che* or Cubit. Here they have two ſorts, one of $13\frac{7}{10}$ *Engliſh* Inches, which the Merchants commonly uſe: the other is of eleven inches, us'd by Carpenters, and alſo in Geographical meaſures.

Albeit *F. Martini* is cenſur'd by *F. Magalhen* for ſpelling a great many *Chineſe* words with ng, which the *Portugueſe* and others have done with m, yet his way is more agreeable to the *Engliſh* pronunciation, only in ſome words the g may be left out, as in *Pekin*, *Nankin*, &c.

Having made enquiry about *Martini's* account of Sowing their Fields at *Ven-cheu* with Oyſter-ſhells, to make new ones grow; I was told that after they have taken out the Oyſters, they ſprinkle the Shells with Urine, then putting them into the Water again, there grows new Oyſters on the foreſaid Shells.

Martini ſays he could never find a *Latin* name for the *Fula Mogorin* of the *Portugueſe*, I'm ſure it's the ſame with the *Syringa Arabica flore pleno albo in Parkinſone.* He ſays alſo, that the *Kieu-yeu* or Tallow-tree bears a white Flower like a Cherry-tree; but all that I have ſeen here bears a ſpike of ſmall yellow Flowers like the *julus* of a *Salix*.

The Bean, or *Mandarin* Broth, ſo frequently mentioned in the *Dutch* Embaſſy and other Authors, is only an Emulſion made of the Seed of *Seſamum* and hot Water.

Their chief employments here are Fiſhing and Agriculture.

In Fiſhing, they uſe ſeveral ſorts of Nets and Lines as we do; but becauſe they have large Banks of Mud in ſome places, the Fiſherman, to go more eaſily thereon, has contriv'd a ſmall frame about 3 or 4 foot long, not much larger then a Hen-trough, elevated a little at each end, in which he reſts upon one Knee, leaning his Arms on a croſs Stick, rais'd ſo high as his Breaſt, and putting out the other Foot often upon the Mud, he puſhes forward his Frame thereon, and ſo carries himſelf along in it.

As to their Agriculture, all their Fields (where any thing is planted) whether high or low, are made into ſuch Plots as may retain the Water on them when they pleaſe. They Plow up their Ground with one Buffelo or one Cow. Where they are to ſow Rice, they prepare the Fields very well, by clearing it of all manner of Weeds, moyſtning to a pulp, and ſmoothing it with a Frame drawn acroſs; on which they ſow the Rice very thick, and cover it only with Water for 2 or 3 inches high, and when it has grown 6 or 8 inches long, they pull it up by the Roots, and tranſplant it (by Tufts in a ſtraight line) to Fields overflown with

Water ; and where a Field is ſubject to Weeds, when the Water drys up, they prevent their growth in overturning the Mud with their hands in the interſtices where the Rice is planted. When they ſow Wheat, Barley, Pulſe, and other Grains, they grub up ſome ſuperficial Earth, Graſs and Roots, and with ſome Straw they burn all together ; this Earth being ſifted fine, they mix with the Seed, which they ſow in holes made in a ſtraight line, and ſo grows up in Tufts as the Rice does ; the field being divided into Beds and Harrowed over, both before and after the Seed is ſown : This makes them ſomewhat reſemble Gardens. Altho they meliorate their Fields where they ſow Rice, only by letting the Water on them, yet for other Grains, where Ground requires it, they make much uſe of Dung, Human Excrements, Aſhes, *&c.* In watering their Fields here they uſe the ſame Inſtrument mention'd by *Martini* in the Preface to his Atlas, being all of Wood, and the contrivance the ſame with that of a Chain-Pump.

Their method in making of Salt is this: All the Shores here being Mud, inſtead of Sand, in the Summer ſeaſon they pare off the ſuperficial Earth, which has been overflown with the Salt Water, and lay it up in heaps for uſe ; when they are to uſe it they dry it in the Sun, rubbing it ſmall ; then digging a Pit, they cover the bottom thereof with Straw, at which through the ſide of the Pit they paſs a hollow Cane, that leads into a Jar, which ſtands below the level of the Pits bottom ; they fill the Pit almoſt full with the foreſaid Earth, and pour Salt Water thereon till it be covered 2 or 3 inches with Water, which drains through, into the foreſaid Jar, and is afterwards boyl'd into Salt.

Had I not found the Printed News Papers laſt year take notice of a ſingular Root brought from *China* by *F. Fontaney*, I ſhould not have told you, that I have ſeen one ſince I came here call'd *Hu-chu-u* (which I take to be the ſame) whereto they aſcribe wonderful properties of prolonging life, and turning grey Hairs into black, by drinking its Infuſion for ſome time, inſomuch that they ſay it's to be had in value from 10 *Tael* to 1000 or 2000 a ſingle Root; for the larger it is, the more is its value and efficacy: which is too much Money here to try the Experiment. You have it mention'd in *Cleyer's Medicina Sinica* No. 84. under the name of *Ho-xeu-u*, according to the *Portugal* ſpelling: It's likewiſe painted in the 27th Table of thoſe Plants Mr. *Petiver* had of me. If you'll have the ſtory of its diſcovery, which I will not warrant for Goſpel, it runs thus. Upon a time a certain perſon going a Simpling among the Mountains, fell by accident into ſuch a ſteep Valley, that he could by no means get out of it again; whereupon looking about for ſomething to ſuſtain his life, in this Melancholy Condition, he eſpy'd this Root, of which he made tryal; and found that in eating thereof, it ſerv'd him both for Proviſions and Cloathing, by keeping his Body in ſuch a temperature, that the injuries of the Weather had no influence upon him during his ſtay there, which was ſome hundreds of years; till at laſt an Earthquake happen'd in that place, whereby the Mountains were rent, and he found a paſſage out to his Houſe, from whence he had been ſo long abſent: But the many Alterations that came to paſs there in ſuch a ſpace of time, would not permit them to give credit to his ſtory; till conſulting the Annals of their Family, which gave an account of one of them loſt at that time, they were confirm'd in the truth of his Relation. And ſo much for this.

IV. *Part of a Letter from Mr* James Yonge *to Mr* John Haughton, *F. R. S. concerning the internal uſe of* Cantharides.

Plymouth, July 17. 1702.

SIR,

A Gentlewoman of 54 years old, who for a long time had been tormented with frequent Fits of the Stone, and uſually brought off many, with the Gravel, *&c.* about an year ſince grew Dropſical, of which being lately cured, ſhe fell into a total ſuppreſſion of Urine, which many days baffled all Remedies.

In this deſperate condition, I reſolved on a deſperate Medicine, and accordingly about 4 in the afternoon, the 5th day of the Diſeaſe I gave her 5 *Cantharides* (without Heads, Wings or Legs) weighing 4 Grains and a half, and with as much Camphire and a little Conſerve, made them into two Pills or Bolus's.

Next morning, finding no effect good or bad, I repented the Medicine; after which, about noon the flood came, and continued above 48 hours, bringing off in that time much more Urine, than could have been expected from her in the whole time of the obſtruction.

Some Gravel, and *Sabulous* matter come away, but no Stones, nor did there any thing happen to the Stomach, Bladder or other Bowels, as uſual on the Internal uſe of thoſe Inſects, but they operated ſo quietly, as if nothing but two doſes of *Lapis Prunellæ* had been adminiſtred.

You know the controverſy which happened lately concerning *the Internal uſe of Cantharides*, occaſioned by Dr

Groenvelt's giving them to cure Ulcers of the Bladder, and I have read his Learned defence of that Practice, and muſt acknowledge that by what I found, Page 111, *&c.* of that Ingenious Apology, wherein are 2 or 3 relations of his ſucceſs in the like caſe by the ſame Medicine, I became encouraged to uſe it to this Patient, having never before done ſo in ſuch a Diſeaſe, or Ulcers of the Bladder.

But in ſeveral other caſes I have often and ſucceſsfully given it, and without the *Dyſuria* and other painful accidents which attend the Internal (oftentimes the External) uſe of this Remedy; altho I mixt no Camphire (Dr *Groenvelt*'s admired Corrective) but waſht it down with large Draughts of Poſſet, Ptyſan, Emulſions or Water-gruel; which in this Ladies caſe I forbore to uſe, becauſe of her dropſical diſpoſition, and uſed only a draught or two of middling Ale, Impregnated with *Broom*, *Juniper-berries*, *Daucus Seeds*, *&c.*

The form in which I uſed to adminiſter this fiery Inſect, is that of a ſoft Pill or Bolus, compoſed of ʒ *Cantharides* prepar, *Troch. e Myrrha* ℈ß. *Sem. Amei* gr. vj R *ob*; *Cynosb.* q. ſ. *This* in ſtubborn ſuppreſſions of the *Lochia* and *Menſtrua*, in difficult Child Birth, and retention of the *Secundine*, does wonders; what heat or pain it begets in the neck of the Bladder, is much ſhort of what I have an hundred times ſeen (and ſometimes felt) to proceed from applying an Epiſpaſtick to the Back.

About 20 years ſince, an enamoured Youth attempted to gain a coy Girl's Love, by giving her a Plumb-Cake, in which Powder'd *Cantharides* was mixed; She eat part of it, and gave three others of the Family in which ſhe lived a ſhare, they were ſoon tormented with burning in the Stomach, Bloody and Scalding Urine, and great Pain in the Back; I cured them all in a ſhort time, by Powder of *Amoos* and *Lapis Prunellæ*, and Emulſions *aq. Sperm.* R. *&c.* How many *Cantharides* each devoured in the Bread, I could gueſs by a piece of it which remained, and ſuppoſe that viii or ix Grains fell to a ſhare.

Olaus Borrichius, Act. Med. *Barthol.* Vol. 4. Obſ. 80. gives a Chymical and Microſcopical examen of thoſe Flies; he ſaith, their parts ſeparated by Chymiſtry do not affect the Skin; that the points of their Particles wound it; and that through thoſe little wounds the Volatile Salt inſinuates; he attempts alſo to ſhew how they cauſe a *Dyſuria*, and offend the Bladder, when applied to a part ſo remote as the Back or Neck. See more from the ſame hand, in the 5th Vol. Obſ. 89.

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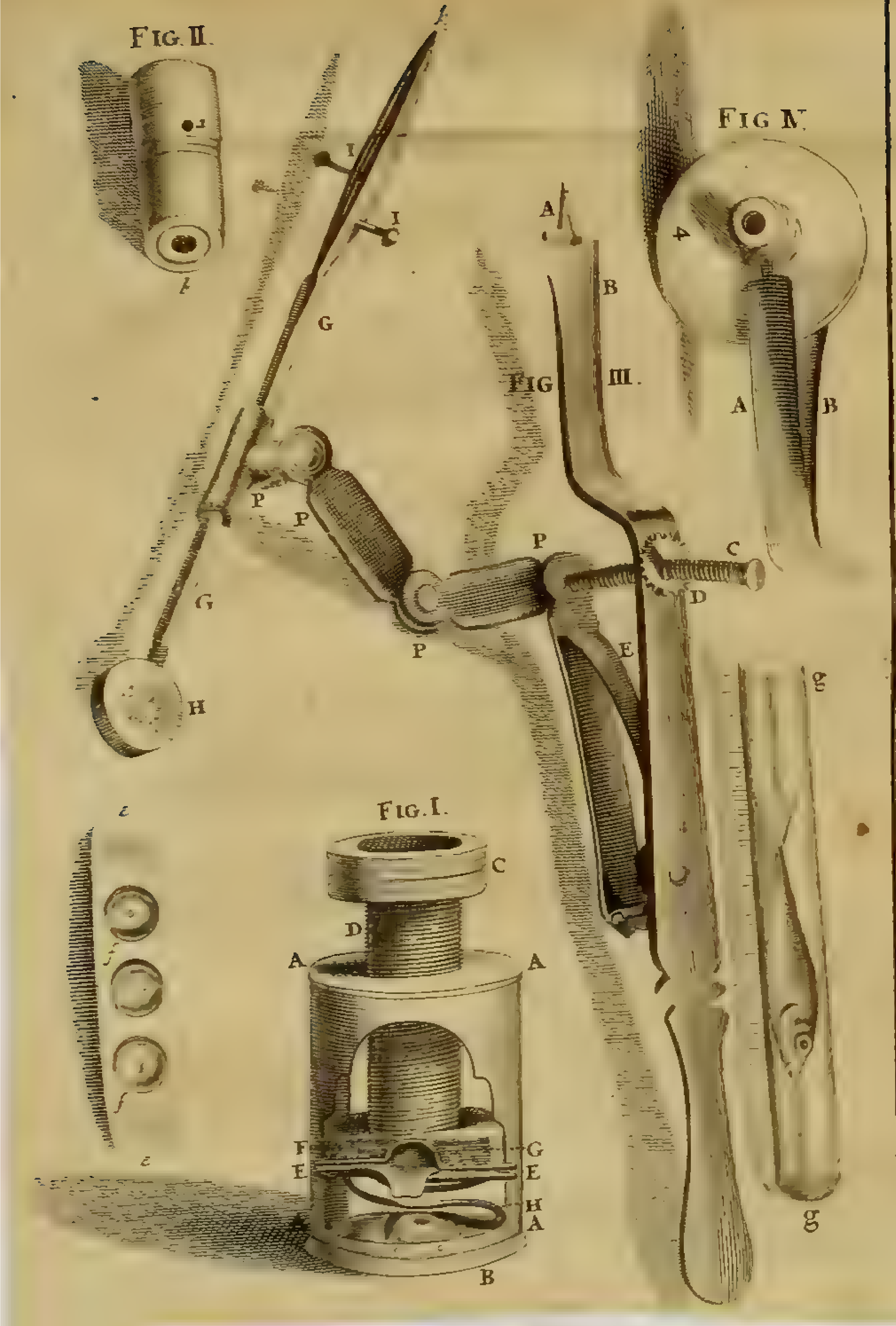
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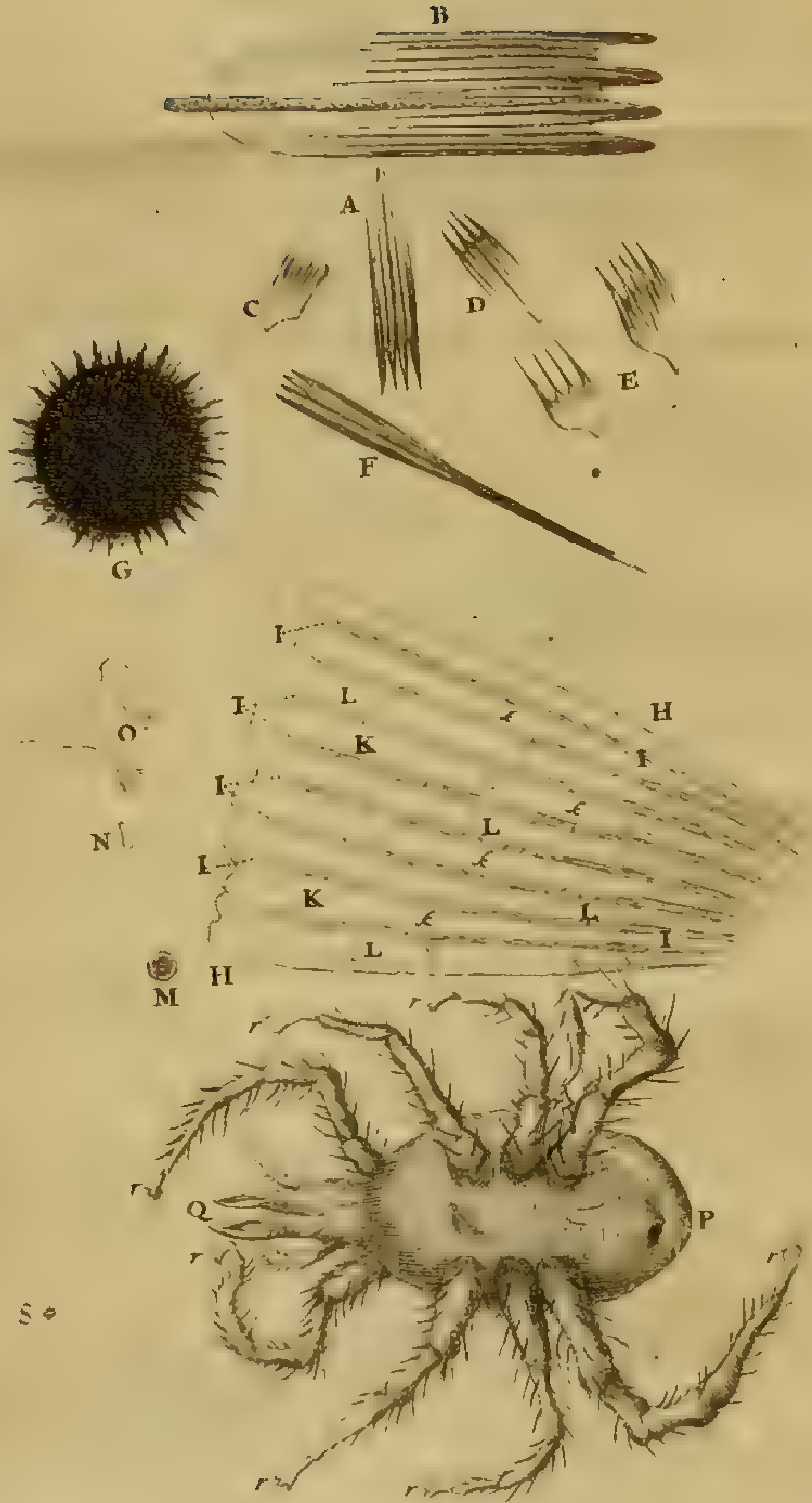
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PHILOSOPHICAL TRANSACTIONS.

For the Months of September *and* October, 1702.

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I. *Part of a Letter to the Publiſher from the Reverend Mr* Abr. de la Pryme, *giving an account of ſome Obſervations he made concerning Vegetation.*

SOme have made experiments of the Meliorating, Fertilizing and Multiplying of Grain, by ſteeping them in divers Liquors. *Digby* ſomewhere mentions a Plant of Barley, all riſing from one Corn, that by ſteeping and watering with Saltpeter, diſſolv'd in Water, brought forth 249 Stalks, and above 18000 Grains. And the laſt Edition of *Cambden* mentions a thing very obſervable, that the Corn ſown in a Field in *Cornwal*, after a great Battel in the Civil War time, brought forth 4 or 5 Ears on every Stalk. I have tryed ſome ſuch like Experiments on ſeveral Grains, and tho I have not been ſo happy, as to meet with that encreaſe therein that I expected, yet as ſome of them were diverting to me in beholding, and perhaps may be to you in reading, ſo I will fill this Letter with ſome of them, that it may not come to you empty.

Upon the 22d of *March*, 1699. I laid to ſteep,

A Pea, a Barley Corn, and a Wheat Corn, in Brimſtone Water.

A Pea, a Wheat, a Barley and an Oat Corn, in Allom Water.

A Pea, a Wheat, a Barley, and an Oat Corn, in an old Diſſol. of Salt of Tartar.

A Pea, a Wheat, a Barly, and an Oat, in the Cap. Mort. of Sal Arm. diſſolved in Urine.

A Pea, a Wheat, a Barley, and an Oat, in the diſſolve of the Salt of Walls.

A Pea, a Wheat, a Barley, and an Oat, in the diſſol. of Saltpeter.

A Pea, a Wheat, a Barley, and an Oat in *Noſtoc* or Star Gelly.

A Pea, a Wheat, a Barley and an Oat Corn in Urine.

I ſteep'd them thus 5 days and 5 nights, and ſet them in a Garden in a good Soil, againſt a North Wall, full in the Sun, on the 27th of the ſame month, after a rainy Night with a Pea, a Wheat, a Barley and an Oat unſteeped.

Upon the 10th of *April* following, I went to ſee them, and found that ſome were juſt come up, ſome not.

The Pea, the Barley and the Wheat ſteep'd in Brimſtone Water all up together.

The Pea ſteep'd in Allom Water very big and ſwell'd, but not ſo much as ſprouted, but the Barley, Wheat and Oat above ground.

The Pea ſteeped in the old ſolution of Salt of Tartar, was half come up, the Wheat ſcarce ſprouted, but the Barley and Oat quite up.

The Pea, the Wheat, the Barley and Oat ſteep'd in the *Caput Mort.* of *Sal Armoniac* diſſolv'd in Urine, were all up together; as were alſo the next row that were ſteep'd in the Solution of Salt of Walls.

The Pea and Wheat ſteep'd in the diſſolution of Saltpeter, were about half up, but the Barley and Oat quite up.

Theſe which were ſteep'd in *Noſtoc*, were none of them come up, nor ſcarce ſprouted.

The Barley and Oat ſteeped in Urine were come up, but the Pea and Wheat ſcarce ſprouted.

And laſtly, to my great ſurprize, the Pea, the Wheat, the Barley and the Oat that were not at all ſteeped, were all of them as ſoon up as any of the former, except only the Wheat, which was about half up.

I ſet them all a Finger deep in the Ground, and there was all the time of their growth very fine weather.

From all which I humbly ſuppoſe that Allom Water is againſt the nature of Peas, and retards their growth, but agrees well enough with Wheat, Barley and Oats.

That the ſolution of Salt of Tartar is not friendly to the nature either of Peas or Wheat, but agreeable or concordant to the nature of the Oats and Barley.

That the Water of Saltpeter had not here any of the great Power or Vertue that I expected, *&c.*

And that theſe ſteepings did not further any of the ſaid Grains in their growth and coming up, but manifeſtly and plainly retarded ſome or moſt of them.

Then I digged all of them up but three ſpires of Barley, which I let ſtand about a foot and a half, or two foot, one from another, which grew and encreaſed ſo exceedingly, that they had ſixty, ſixty five, and ſixty ſeven ſtalks apiece from their ſingle Grain and Root, with every one an Ear on, and about 40 or ſomewhat more Corns apiece in them, which increaſe proceeded perhaps not ſo much from the Grain having been ſteeped in any Liquors, as from the fertility and goodneſs of the Soil, and their competent diſtance one from another. I obſerved that new ſhoots continually ſtruck up from the Root; and that, as in the *Eaſt* and *Weſt Indies*, there are Trees that always bears Bloſſoms, and Flowers, Green and Ripe Fruit at the ſame time, ſo that here if the Envigorating heat of the Sun had not been cool'd and weakned by the approach of the Winter Seaſon, there would have continually been new, ripe Corn, and empty Ears on the ſame Root.

II. *A*

II. *A Diſcourſe concerning ſome Influence of* Reſpiration *on the* Motion *of the* Heart, *hitherto unobſerved. By* J. Drake, M. D. F. R. S.

THo divers accurate Treatiſes of the *Heart*, and its action, have been written by Learned Men of ſeveral Nations, eſpecially by two of our own Country; the Great *Dr Harvey*, to whoſe happy Sagacity this Nation owes the Glory of the Invention of the *Circulation* of the *Blood*; and the incomparable *Dr Lower*, to whom we are beholding for a compleat diſplay of the *Mechanical Structure* of the *Heart*, and a moſt ingenious Rationale of its Action. Yet there remain ſeveral doubts and difficulties about it (in my opinion) not ſufficiently accounted for, towards the reſolving ſome of which I ſhall offer what my own thoughts have ſuggeſted to me, and leave it to the conſideration of the Reader.

The Learned *Dr Lower* (whoſe accurate piece on this Argument will inſure his Reputation ſo long as Phyſical knowledge ſhall laſt in eſteem) has ſo well accounted for the *Syſtole*, or Contraction of the Heart from the *Mechanical* Structure of it, that he ſeems almoſt to have exhauſted the ſubject, and had he been as happy in diſcovering the true cauſe of the *Diaſtole*, he had left little room for the Induſtry and Sagacity of others about this *Viſcus*.

But having judiciouſly and ſolidly explain'd the *Syſtole*, he contents himſelf to aſcribe the *Diaſtole* to a motion of *Reſtitution*, which account gives me no ſatisfaction: Becauſe the *Syſtole* being the proper, and (as himſelf confeſſes) the only motion of the Heart, a ſtate of *Contraction* ſeems to be the natural ſtate, and conſequently without external violence, it ſhou'd have no *Diaſtole* at all.

This

This will appear more plain, if we conſider the circumſtances of it, and its motion, as a Muſcle, with reſpect to other Muſcles. That Contraction is the proper Action, and ſtate of all Muſcles, is evident from Experience of Fact, as well as Reaſon. For, if any Muſcle be freed from the power of its *Antagoniſt*, it is immediately *contracted*, and is not by any action of the Will, or Spirits to be reduc'd to a ſtate of *Dilatation.* Thus, if the *Muſculi Flexores* of any Joint be divided, the *Extenſores* of that Joint being by that means freed from the contrary Action of their *Antagoniſts*, that Joint is immediately extended without any conſent of the Will, and in that ſtate it remains; and ſo *Vice verſâ* if the *Extenſores* be divided. From whence it is plain, that the Muſcles have no reſtitutive motion, but what they derive from the Action of their *Antagoniſts* by which they are ballanc'd. Thus likewiſe the *Spincters* of the *Gula*, *Anus* and *Veſica*, having no proper *Antagoniſts*, are always in a ſtate of Contraction, and ſuffer nothing to paſs 'em, but what is forced thro 'em by the contrary Action of ſome ſtronger Muſcles, which, tho not properly to be call'd *Antagoniſts*, yet on all neceſſary occaſions perform the office of ſuch.

That the Heart is a Muſcle, furniſh'd and inſtructed for motion like other Muſcles, is (in my opinion at leaſt) demonſtrated beyond contradiction by Dr *Lower* and others. And, as it is a *Solitary* Muſcle without any proper *Antagoniſt*, and not directly under the power of the Will, nor exerciſing *Voluntary* motion, it approaches neareſt to the *Sphincter* kind, which only has theſe conditions in common with it. But in conſtant and regular alternations of Contraction and Dilatation, it differs exceedingly from all the Muſcles of the Body.

This *reciprocal Æſtus* of the Heart has given the Learned abundance of trouble; who, finding nothing peculiar in the ſtructure, which ſhou'd neceſſarily occaſion it, nor any

Antagoniſt, whoſe re-action ſhou'd produce it, have been extreamly perplext to find out the cauſe of it.

But paſſing over the various opinions of Authors, to avoid being tedious, I ſhall take notice here only of the very Learned Dr *Lower*'s, in whoſe account of the *Syſtole*, however ſolid and ingenious, I obſerve ſomething deficient, and whoſe *Hypotheſis* of the *Diaſtole* I think to be precarious and falſe.

This excellent Author, having by ſound Arguments, drawn from the Structure and Mechaniſm of the Heart, eſtabliſht the certainty of its *Muſcular* Motion, reſts ſatisfied, without taking notice of any Aſſiſtance, that the Heart receives from any other Part, except from the Brain, by the means of the eighth Pair of Nerves.

The Accurate *Borellus* in his *Oeconomia Animalis* computes the *Motive* Power of the *Machine* of the Heart to be *Part 2d. Prop. 67.* equal to, or to ſurmount that of a Weight of 3000 *l.* The *Prop. 73.* *Obſtacles* to the Motion of the Blood thro the *Arteries* he eſteems equivalent to 180,000 *l.* which is 60 times as much as he rates the Force of the Heart at. Then deducting 45,000 *l.* for the Adventitious Help of the *Muſcular Elaſtick Coat* of the *Arteries*, he leaves the Heart with a Force of 3,000 *l.* *Prop. 76.* to overcome a reſiſtance of 135,000 *l.* that is, with 1 to remove 45.

This ſtupendous effect he contents himſelf to aſcribe to the *Energy* of *Percuſſion*. But, had he proceeded in his Calculation to the Veins, which he allows to contain conſtantly a quantity of Blood, quadruple to the Contents of the Arteries, and to which this *Energy* of *Percuſſion* does either not reach at all, or but very languidly, he might probably have ſeen a neceſſity for ſome other Expedient to remove ſo inſuperable a difficulty.

But not to inſiſt rigorouſly on the exactneſs of this Calculation (tho the great Abilities of the Author in this way, and his Ingenuity and Modeſty, are a ſufficient Warrant for the accuracy of his Computations, and the fidelity of his Accounts) we may allow a much greater Deduction, than would be juſtifiable, without leſſening the difficulty. But this account I have taken notice of purely for the ſake of the Calculation, which may be of uſe in the Sequel, the account it ſelf being in other reſpects more defective than Dr *Lower's*, to which we will return.

The Dr, notwithſtanding his great Sagacity, appears (to me) to have overlookt ſomething of very great moment, and importance in the explication of the Action of the Heart. For, tho it wou'd be granted, that the *Muſcular Fibres* of the Heart acted by the Nerves, are the immediate Inſtruments of its *Conſtriction* or *Syſtole*, yet it muſt not be denied, that the *Intercoſtal* Muſcles and *Diaphragm* are of great ſervice to aid and facilitate this Contraction, by opening a Paſſage for the Blood thro the Lungs, which denied wou'd be an invincible obſtacle.

Neither do they promote it that way only. The manner how they farther aſſiſt the Heart in its Contraction, will appear manifeſtly, if we conſider the different Poſture, Scituation and Capacity of the Blood Veſſels of the Lungs in the ſeveral times of *Elevation* and *Depreſſion* of the *Coſtæ*.

The *Pulmonary* Artery riſes from the *right* Ventricle of the Heart, and runs in one Trunk, till it comes to the *Aſpera Arteria*, where it is divided, and ſends a Branch along with each diviſion of the *Aſpera Arteria*, according to all the minuteſt ſubdiviſions, of which it is likewiſe ſubdivided, accompanying all the *Bronchi*, in their whole progreſs thro the Lungs.

The *Pulmonary* Vein, which empties it ſelf into the *Left* Ventricle of the Heart, ſpreads it ſelf on the *Aſpera Arteria* and *Bronchi*, in the ſame manner that the Artery does.

The neceſſary conſequence of this diſpoſition is, that this Artery and Vein being coextended with, and faſten'd to the *Bronchi*, muſt needs ſuffer ſuch alteration of *Superficial* Dimenſions, as the *Bronchi* do in the *Elevation* or *Depreſſion* of the *Coſtæ*.

While the Ribs are in a ſtate of *Drepreſſion* (whether before Commerce with the external Air or after) the *Annular Cartilages* of the *Bronchi* ſhrink one into another, and by that means their *Dimenſions* are exceedingly contracted. In conformity to this condition of the *Bronchi* the *Pulmonary* Artery and Vein muſt likewiſe, either by means of their *Muſcular* Coats contract themſelves to the ſame *Dimenſions*, or lye in *Folds* or *Corrugations*, which is leſs probable.

On the other hand, when the Ribs are elevated, and the *Diaphragm* bears downward, the Air ruſhing into the Lungs, ſhoots out the *Cartilaginous* Rings, and *Divaricates* the Branches of the *Trachea*, and by them extends and divaricates the ſeveral diviſions of the *Pulmonary* Artery and Veins, and thereby lengthens and enlarges their Cavities.

This enlargement of their Cavities is very conſiderable, not only upon the ſcore of the addition, which they receive in length thereby, but alſo upon the account of their *Divarication*. For whereas, when the Ribs are depreſt, and the Lungs ſubſide, the Blood Veſſels are not only contracted, (as I have already obſerv'd) but their Branches, which are exceeding numerous, approach one another, and lie in juxta-poſition, by which their Cavities are very much compreſs'd and ſtreighten'd : when the Ribs are elevated, and the Lungs turgid with Air, not only the Fibres, by which their Coats in the oppoſite State were contracted, are extended, but thoſe innumerable Veſſels, which lying before in lines almoſt parallel upon one another, compreſs'd one another, making an *acute* Angle at their Junctures, are divaricated and ſeparated from each other, and make an *obtuſe*, whereby their Channels are widen'd.

Thus a paſſage is open'd to the Blood, from the *Right* Ventricle of the Heart to the *Left*, thro the Lungs, to which it cou'd not otherwiſe paſs ; and the oppoſition, which the Blood, contain'd in that Ventricle, muſt otherwiſe neceſſarily have made to its conſtriction, is taken off, and the *Syſtole* thereby facilitated.

Nor is that all. For the *Diaſtole* being caus'd (as I ſhall in the ſequel ſhew) by the Force of the Blood ruſhing into the Ventricles, this Ampliation and Extenſion of the *Pul-*

monary Artery is a ſort of *Check* or *Counterpoiſe* to it, and prevents an endeavour towards two contrary Actions at once, which muſt neceſſarily fruſtrate both. For the Heart being a *Springy*, *Compreſſible* Body, whoſe proper Action, which is Contraction, depends on the influx of certain Fluids into its Fibres, or Subſtance; and containing beſides a Fluid in its *Ventricles*, or great Cavities, in one of which is the Mouth of this Artery, the action of this Veſſel muſt in great meaſure reſemble that of a *Syringe*, whoſe extremity is immers'd in Water, the Enlargement or Expanſion of the Channels of the Artery anſwering the drawing of the *Embolum*, as the Conſtrictive Motion of the Muſcle of the Heart does the Preſſure of the *Atmoſphere* upon the *Surface* of the Water, the one making way for the fluid, and the other forcing it to follow, where the reſiſtance is leaſt. In this ſenſe we may allow a ſort of Attraction to the *Pulmonary* Artery, depending wholly upon the Action of the *Intercoſtal* Muſcles and *Diaphragm*, which we muſt therefore confeſs to be very ſerviceable and inſtrumental in promoting the *Syſtole* of the Heart.

But if the Learned Author be deficient in his account of the *Syſtole*; that is, if he has not obſerv'd all the Mechaniſm and Contrivance of Nature for the Contraction of the Heart; much leſs ſufficiently has he accounted for the *Diaſtole*, or Dilatation of it, which he aſcribes to a Motion of *reſtitution* of the over-ſtrain'd Fibres, which yet he confeſſes are made for *Conſtriction* only. 'Tis true, he immediately after joyns the *influx* of the *Blood* as a concurrent cauſe; but from the ſlight notice that he takes of it, 'tis plain, that he did not ſo much as dream of any great ſhare it had in that action. His words are theſe.

De Corde Pag. 75.

Quin & (ut obiter hoc moneam) cum omnis motus contractione perficiatur, & Cordis Fibræ ad conſtrictionem ſolum factæ ſint, apparet quoque Cordis motum totum *in* Syſtole *poſitum eſſe; cumq; Fibræ ultra tonum ſuum in omni conſtrictione ejus tendantur, idcirco ubi nixus iſte abſolvitur, motu quaſi* reſtitutionis *Cor* *iterum relaxatur, & ſanguine a Venis* influente *rurſus diſtenditur*; *a* nullo *enim cordis motu, niſi* tenſionem ſuam remittente, *& ab* irruente *ſanguine* Diaſtole *ejus libratis adeo viribus ſuccedit.*

I have tranſcribed the entire Paragraph, becauſe it contains his whole *Hypotheſis* of the *Diaſtole*, and all the notice that he takes of it thro his whole Work. But how ſlender ſoever this may prove, it is the moſt ſubſtantial that I have any where met with, except a late one of Mr *Cowper*, which is properly an improvement of this, and ſhall be conſidered in the ſequel.

But, if Contraction be the ſole Action of theſe Fibres (as this Great Man confeſſes it to be) and as indeed it is of all *Muſcular* Fibres, I wonder how ſo judicious a Writer came to ſlip into ſuch an abſurdity, as to call their Diſtenſion (vulgarly but improperly called Relaxation) a Motion of *Reſtitution*. For from the Nature of thoſe Fibres, and their diſpoſition in the Structure of the Heart, the Natural State of the Heart appears manifeſtly to be *Tonical*, and its Dilatation a State of Violence; and conſequently the Conſtriction is the *true* motion of *Reſtitution*, and the State to which it will *ſpontaneouſly* return, when the Force is taken off, which is the work of the *Intercoſtal* Muſcles and *Diaphragm.*

Thus we are left ſtill to ſeek for the true cauſe of the *Diaſtole*, which ſeems to me to be the main and moſt difficult *Phænomenon*, relating to the Heart and the Circulation of the Blood. But in Mr *Cowper*'s ingenious *Introduction* to his *Anatomy of Human Bodies*, I find the Share which *Dr Lower* hints the Blood to have in that Action, further proſecuted, and improv'd into the main Inſtrument of the Dilatation of the Heart, wherein I agree entirely with him. But as to the manner, and reaſons of its being ſo very Inſtrumental, I can't be ſo perfectly of his mind.

The Heart (ſays this accurate Anatomiſt) *of an Animal bears a great Analogy to the Pendulums of thoſe Artificial*

Automata, Clocks and Watches, whilſt its Motion is performed like that of other Muſcles, the Blood doing the Office of a Pondus.

This Explication, being but a Simile without a diſtinct application to particulars, is beſide ſo very ſhort, that I can at beſt but give a conjecture at the meaning, which if I miſtake, I ſhall deſerve to be excuſed, and expect to be better inform'd.

By the *Blood*'s doing the Office of a *Pondus*, I ſuppoſe he means, that the Blood contributes in the ſame manner to the Motion of the Heart, as the *Weights* do to that of the *Pendulum* of a *Clock*. If ſo, the Blood, according to him, muſt be the Inſtrument of *Conſtriction*; and *Dilatation* muſt be the *Natural* State, or *Spontaneous* Motion, to which it wou'd, when under no Violence, return; the contrary of which, I preſume, will appear e're I have done.

But if he means, that the *Blood* in its reflux, by *gravitating* on the *Auricles* and *Ventricles*, dilates and expands 'em, acting therein as a *Counterpoiſe* to its contraction as a Muſcle, I cou'd wiſh his deſign had not bound him up to ſo narrow a compaſs, and that he had given us an explication at large of ſo abſtruſe and ſo important a *Phænomenon*. Becauſe the *Specifick Gravity* of the Blood ſeems to me a cauſe by no means alone adequate to the effect, which it is here ſuppos'd to produce.

For, if the Blood acts only as a *weight* by meer *gravitation*, then that part of it only which deſcends from the Parts above the Heart can be employ'd in that action. This at the largeſt computation can't amount to five pound weight, and muſt, according to the computation of *Borellus*, force a Machine,that is able to overcome a reſiſtance of 135,000*l.* I leave every man to deduct what he ſhall upon examination find reaſonably to be deducted, and yet ſhall reſt ſecure, that it is not to be effected in the leaſt with ſo ſmall a Weight.

But neither does the *Refluent* Blood gravitate in any ſuch proportion, as I have here aſſign'd. For to make a true eſtimate of its *Gravitation*, we muſt conſider the circumſtances of the Liquor ſuppos'd to gravitate; in which it very much reſembles Water inclos'd in a recurve Tube, of which, if the length of the two Legs be equal, it may be ſuſpended in the Air full of Water, with the Extremities downwards, without loſing a drop, altho the *Diameter* of thoſe Legs ſhou'd be very unequal. The Caſe of the Arteries and Veins is pretty near a parallel to a Tube, ſo fill'd and inverted. For, if the Arteries and Veins be continued Tubes, (as by the Microſcope they are made to appear) then ſuppoſing their contents to have no other determination of Motion, than their own weight wou'd give 'em, the contain'd Fluids muſt be counterpoiſes to each other. For the Veins and Arteries being join'd at the ſmaller extremities, and the larger of both terminating in the ſame Parallel Line, it is impoſſible, according to the Laws of *Hydroſtatics*, that the contents of either ſhou'd overballance t'other. How far then muſt it fall ſhort of forcing the natural Power and Reſiſtance of ſo ſtrong a Muſcle as the Heart, by meer Gravitation.

The Blood indeed has a *Progreſſive* Motion thro its Veſſels, wherein it differs from Water, in a recurve Tube, in the experiment above ſtated. But, if the natural Gravitation of the Blood contributes nothing to the Dilatation of the Heart, this Progreſſive Motion will not be found much more ſufficient. For, as this Motion is deriv'd entirely from the Heart's Conſtriction (as all accounts hitherto derive it) cou'd the Blood be ſuppos'd to re-act upon the Heart, with all the force firſt impreſs'd upon it by the Heart, it wou'd be inſufficient, unleſs we will ſuppoſe the *Force communicated* to be ſuperiour to the *Power Communicant*, which is abſurd.

But when the juſt and neceſſary Deductions for the Impediments, which the Blood meets with in its Progreſs thro the Veſſels, ſhall be made, the remaining Force will be found ſo exceeding weak, that to prop the Blood thro the Veins may be a task alone too great for ſo ſmall a Power, without charging it with the additional difficulty of forcing the Muſcle of the Heart.

Alphonſus Borellus, after a great deal of ſolemn pains taken to ſhew his care and exactneſs, and to poſſeſs his Reader of the truth of his Calculations, caſts up the Force of the Heart, and the *Muſcular* Coat of the Arteries, to be together equal to a weight of 3,750 *l.* and allots 'em a Reſiſtance equal to 180,000 *l.* to overcome which is 45 to 1. To make up for a diſproportion, by his own confeſſion, incredible to thoſe who have not conſidered the matter as he had done, he flings into the Scale the additional *Force of Percuſſion*, which he leaves *indefinite*, and thinks ſufficient to *force any quieſcent finite Reſiſtance whatſoever.*

But as this Acconnt and *Hypotheſis* are part of a Poſthumous Work (if a liberty of Conjecture may be allow'd in ſo uncertain a matter,) I ſhou'd ſuſpect, that theſe Papers were left unfiniſht by *Borellus*; or at leaſt, that in many places the laſt hand was never put to 'em. For, neither in this Place, nor any other of this Work, does he account for any more than the *Syſtole* of the Heart, and the reſiſtance which is made to the Progreſſive Motion of the Blood in the Arteries only. This alone he found to exceed the Power of the Heart ſo prodigiouſly, that he ſeems to ſhuffle it off his hands with a general and precarious Solution, as a difficulty that he was deſirous to be rid of. For, having aſcrib'd this *ſtupendous* (as he himſelf calls it) effect to the *Energy of Percuſſion*, he takes no care to ſatisfie his Reader any farther about it, or to refer him, or give him the expectation of ſatisfaction any where elſe; altho he has an expreſs Treatiſe on the *Force of Percuſſion*, which was written preparatory to this, and to which he frequently refers in other Places of this Work. But what confirms my ſuſpicion, that this part was intended for a farther Reviſe by the Author, is, that he has left the Progreſs of the Blood thro the Veins, and the *Diaſtole* of the Heart, abſolutely untouch'd, tho they are difficulties of a much greater Magnitude, than this which he has attempted to account ſo ſlightly for. For, in theſe he is excluded the benefit of *Percuſſion*, and has yet a greater reſiſtance to overcome without it. Omiſſions of this kind are ſo unuſual with this Author, where-ever he knows himſelf to go upon ſure grounds, that it is to me an Argument, that he doubted the ſufficience of his *Percuſſion*, and reſerv'd theſe important *Phænomena* for farther conſideration, without plunging himſelf into ſuch an Abſurdity as to aſcribe to *Percuſſion* any ſuch *Energy* as to be able (ſo broken as it returns to the Heart) by its re-action to force that Power, from whence only it was at firſt deriv'd.

Dr *Lower* and Mr *Cowper* deliver their Opinions of the Cauſe of the Dilatation of the Heart ſo very ſhort, and without any Arguments to ſupport 'em, that by expoſing 'em naked, they ſeem rather to diſcourſe of it tranſiently, as men obliged by the nature of their Subjects to ſay ſomething of it, than ſolicitous to give any full or ſatisfactory Account, and therefore I ſhall proceed no farther upon 'em here.

But tho the *Hypotheſis* of *Borellus* may in this caſe be found precarious or inſufficient (a misfortune that has befallen him in divers other particulars) his *Theory* holds ſtill good. At leaſt it ought to be allowed in juſtice to his great Abilities and Exactneſs, till ſome body convicts him of ſome material Error in his Calculations, which has not as yet been done by any body, that I know of.

Suppoſing then the Force of the Heart, and of the *Muſcular* Coat of the Arteries, as likewiſe of the reſiſtance, which they muſt overcome, to be computed with any degree of accuracy, there remains yet ſuch a prodigious diſproportion to be accounted for, as requires ſome more powerful Agent, than any yet aſſign'd, to make up the deficiency.

What aſſiſtance the Heart receives from the action of the *Thorax* towards the facilitating its contraction, without which aſſiſtance there cou'd have been no *Syſtole*, has been already ſhewn. But neither the *Intercoſtal* Muſcles, or *Diaphragm*, which are ſo inſtrumental in that part of its action, can contribute any thing to the *Diaſtole*; becauſe they ſerve only to enlarge the cavity of the *Thorax*, and thereby to open a Paſſage to the Blood from the Heart, and promote its Conſtriction.

Whatever therefore the Force is, that dilates the Heart, and is the Cauſe of the *Diaſtole*, it muſt be equal to that of the Heart, the *Intercoſtal* Muſcles and *Diaphragm*; to all which it acts as an Antagoniſt. I take no notice of the *Serratus Major Anticus*, and other Muſcles, which have an obſcure ſhare in the *Elevation* of the *Coſtæ*, becauſe as much may reaſonably be deducted upon the account of the *Obliquus externus Abdominis*, and other Muſcles; which, having their inſertions on ſome of the lower *Ribs*, are as inſtrumental towards the *Depreſſion* of 'em, and ſo ballance the account. But the chief uſe of theſe is in violent Reſpiration. In ordinary Reſpiration their ſhare is ſmall.

Such a real Power (which may in the leaſt be ſuſpected of any ſhare in this Action) is hard, perhaps impoſſible to be found in the *Machine* of any *Animal* Body; and yet without ſome ſuch Antagoniſt,it is as impoſſible the Circulation of the Blood ſhou'd be maintain'd. All the Engines yet diſcover'd within the Body conſpire towards the *Conſtriction* of the Heart, which is the *State* of *Quieſcence*, to which it naturally tends. Yet we find it alternately in a *State* of *Violence*, that is, of *Dilatation*; and this upon neceſſity, becauſe upon this *Alternation* depends all Animal Life.

Some ſufficient Cauſe external muſt therefore be found, to produce this great Phænomenon, which Cauſe muſt be either in the *Air*, or *Atmoſphere*, becauſe we have no conſtantt and immediate Commerce with any other *Mediums*.

Some great Phyſicians obſerving this, and that depriv'd by whatſoever Means of Communication with the *external* Air, we became inſtantly extinct, have imagin'd, that in the Act of Inſpiration certain purer parts of the Air mixed with the Blood in the Lungs, and was convey'd with it to the Heart, where it nouriſh'd a ſort of *Vital Flame*, which was the cauſe of this reciprocal *Æſtus* of the Heart. Others not quite ſo groſs, rejecting an *Actual* Flame, have fancied that theſe fine Parts of Air mixing with the Blood in the Ventricles of the Heart, produc'd an *Effervеſcence* which dilated it. But theſe Fancies have been long ſince exploded and condemn'd upon ample Conviction, and 'tis a Point yet undetermin'd, whether any Air does mix with the Blood at all in the Lungs, or not.

But ſuppoſing that ſome Air may inſinuate it ſelf into the *Pulmonary* Vein, it can no other way dilate the Heart than by an Effervеſcence in the Left Ventricle, which wou'd not dilate the Right. But this opinion is contradicted by *Autopſie*, and too laboriouſly confuted by others, to be brought upon the Stage again here.

There remains therefore only the *groſs Body* of the *Atmoſphere* to be conſider'd, which is undoubtedly the *true Antagoniſt* to all thoſe Muſcles, which ſerve for ordinary Inſpiration and the Conſtriction of the Heart. This will appear more evidently, if we conſider not only the Power, but the neceſſity of its Action upon *Animal* Bodies, as well as the want of other ſufficient Agents.

The Heart is a *Solitary* Muſcle of very great ſtrength, and the *Intercoſtal* Muſcles and Diaphragm, which likewiſe have no *Antagoniſts*, are a vaſt additional Force, which muſt be ballanc'd by the contrary action of ſome equivalent Power or other. For, tho the Action of the *Intercoſtal* Muſcles be voluntary, that does not exempt 'em from the condition of all other Muſcles ſerving for *voluntary* Motion, which wou'd be in a State of perpetual contraction, notwithſtanding any Influence of the Will, were it not for the libration of *Antagoniſt* Muſcles. This libration between other Muſcles is anſwer'd by the *Weight* of the incumbent *Atmoſphere,* which preſſes upon the *Thorax* and other Parts of the Body. And, as in all other voluntary Motions the influence of the Will only gives a Prevalence to one of two Powers before equilibrated, ſo here it ſerves to enable thoſe Muſcles to lift up a Weight too ponderous for their ſtrength not ſo aſſiſted; and therefore as ſoon as that aſſiſtance is withdrawn, the *Coſtæ* are again depreſs'd by the meer *Gravitation* of the *Atmoſphere,* which wou'd otherwiſe remain elevated thro the natural tendency of thoſe Muſcles to contraction.

This is evidently prov'd from the *Torricellian* experiments, and thoſe made upon Animals in *Mr Boyle's* Engine; where, as ſoon as the Air is withdrawn, and the *preſſure* thereby taken off, the Intercoſtal Muſcles and Diaphragm are contracted, and the Ribs elevated in an inſtant, and can't by any power of the Will be made to ſubſide, till the Air is again let in to bear 'em forcibly down.

De Reſpirationis Organis & Uſu.

It were ſcarce worth while to take notice here of a Miſtake of the Learned Dr *Willis,* were it not for the Great Authority of the Man, which is almoſt ſufficient to keep Error in countenance. The Dr having obſerv'd that the Fibres of the *External* and *Internal Intercoſtal* Muſcles ran in a contrary order, as it were, decuſſating each other, takes occaſion from thence to fancy, that there was an oppoſition in their Office, and that as the *External* ſerv'd to raiſe up the Ribs, the *Internal* drew 'em down again, forgetting at that time, That, when a contractile Body is faſten'd at the ſeveral ends to Points unequally movable, let the Contraction happen in what part or manner ſoever, the more movable Point muſt be drawn towards the leſs movable: By which rule, whether *External* or *Internal Intercoſtals* be contracted, the lower Ribs will be forc'd to approach the upper, that is, be rais'd up.

As in the Elevation of the *Coſtæ*, the Blood, by the paſſage that is open'd for it, is in a manner ſollicited into the Lungs, ſo in the Depreſſion of 'em, by the ſubſidence of the Lungs and the Contraction of the Blood Veſſels, both which are conſequent thereof, the Blood is forcibly driven, as it were with an *Embolum*, thro the Pulmonary Vein into the Left Ventricle of the Heart. And this, together with the *general Compreſſion* of the *Body* by the *weight* of the *Atmoſphere*, which ſurrounds and preſſes upon the whole Surface of it, is that Power which cauſes the Blood to mount in the Veins, after the force impreſs'd upon it by the Heart is broken and ſpent, and which is ſufficient to force the Heart from its natural State to dilatation.

He that is able to compute the weight of a Column of Air, equal to the Surface of the whole Body, will readily grant it a Power ſufficient for the Effects, which are here aſcrib'd to it. And, when he conſiders, that the Bodies of Animals are compreſſible Machines, he will find that it muſt of neceſſity affect them in the manner here laid down. But tho our Bodies be entirely compos'd of *Tubuli*, or Veſſels fill'd with Fluids, yet this Preſſure, how great ſoever, being equal, cou'd have no effect upon 'em, if the ſuperficial Dimenſions were not eaſily variable; becauſe being compreſs'd on all parts with the ſame degree of Force, the contain'd Fluids cou'd not any where begin to recede, and make way for the reſt to follow, but wou'd remain as fixt and immovable as if they were actually ſolid. But by the Dilatation of the *Thorax*, room is made for the Fluids to move, and by the Coarctation of it freſh motion is impreſt, which is the main Spring whereby the Circulation is ſet and kept going.

This reciprocal Dilatation and Contraction of the Superficial Dimenſions of the Body ſeems ſo neceſſary to Animal Life, that there is not any Animal ſo imperfect as to want it, at leaſt none to the inward Structure, of which our Anatomical Diſcoveries have yet reach'd. For, tho moſt kinds of *Fiſh*, and *Inſects*, wants both *moveable* Ribs, and Lungs, and conſequently have no dilatable *Thorax*, yet that want is made up to 'em by an *Analogous* Mechaniſm, anſwering ſufficiently the Neceſſities of their Life.

Thoſe Fiſhes, which have no Lungs, have *Gills*, which do the *Office* of Lungs, receiving and expelling alternately the Water, whereby the *Blood Veſſels* ſuffer the ſame Alteration of Dimenſions, that they do in the Lungs of more perfect Animals.

The Lungs or *Air Veſſels* of Inſects are yet exceedingly more different in Structure, Diſtribution and Scituation from thoſe of perfect Animals, than thoſe of Fiſhes are, and yet in their Uſe and Action agree perfectly with both, that is, *receiving* and *expelling* the Air, and *varying* the *Dimenſions* and *Capacities* of the *Blood Veſſels*. Theſe having no *Thorax*, or ſeparate Cavity for the Heart and Air Veſſels, have the latter diſtributed thro the whole Trunk of their Bodies, by which they communicate with the *External* Air thro ſeveral *Spiracula* or *Vent Holes*, to which are faſten'd ſo many little *Tracheæ*, or Wind-pipes, which thence ſend their Branches to all the Muſcles, and *Viſcera*, and ſeem to accompany the Blood Veſſels all over the Body, as they do in the Lungs only of Perfect Animals. By this diſpoſition in every *Inſpiration*, the whole Body of theſe little Animals is inflated, and in every *expiration* compreſs'd, and conſequently the Blood Veſſels muſt ſuffer a *viciſſitude* of Extenſion and Conrraction, and a greater motion muſt thereby be impreſs'd upon the Fluids contain'd in 'em, than the Heart, which does not in theſe Creatures appear to be Muſcular, ſeems capable of giving.

The only Animal that is exempted from this neceſſary condition of *Breathing*, or *receiving* and *expelling alternately ſome fluid* into and out of the Body, is a *Fœtus*. But this, while included in the Womb, has little more than a *vegetative* Life, and ought ſcarce to be reckon'd among the number of *Animals*. For, were it not for that ſmall ſhare of *Muſcular* Motion, which it exerciſes in the Womb, it might without abſurdity be accounted for as a Graft upon, or Branch of the Mother.

Concerning the immediate matter, and means of Life, and Nutrition, Authors are not agreed, nor is it the buſineſs of this place to reconcile, or decide their differences, but to account for the motion of the Blood thro the Veſſels only. In order to this, it will be neceſſary to obſerve, that the Pulſation of the Heart in a *Fœtus* is ſo very weak and obſcure, and the motion of the Blood ſo extream ſlow and languid, as to be ſcarce, if at all, perceivable, as has been experienc'd in the Diſſection of Puppies before Reſpiration had. To produce ſuch a feeble Palpitation, and creeping Motion, no greater force ſeems to be requir'd than may be deriv'd from the Communication between the Veſſels of the Mother and *Fœtus* in the *Placenta.* I am not ignorant, that divers very Learned Anatomiſts (whom the Crowd have implicitly follow'd) have abſolutely rejected all Communication between theſe Veſſels. But, with ſubmiſſion to Great Authorities, I think they have acted arbitrarily, and without ſufficient Warrant from Reaſon or Experiment. For neither are the Arguments which they bring againſt it concluſive, nor the Office which they aſſign to the Umbilical Veſſels in lieu of it, proper, or natural to thoſe Veſſels, or the reality of the Fact made out by any ſubſtantial Reaſons. Thoſe that reject this Communication uſually do it in favour of one or both of theſe Opinions, that the Arteries of the *Uterus* do depoſite a Nutritive Juice, or a Juice impregnate *with Air* in the *Placenta*, which is ſuck'd in by the *Umbilical* Vein, and convey'd to the *Fœtus*, for the neceſſary Uſes of Nutrition and Life. Now thoſe that patronize either of theſe Opinions lead Nature an unneceſſary dance. For if the *Maternal* Blood does really contain any ſuch *Nutritious*, or any ſuch neceſſary *Aerial* Particles, why ſhou'd they be ſeparated and extravaſated, to be with difficulty receiv'd into the *Umbilical* Vein, and again mixt with

Boyle *of the Elaſticity of Air.*

Pechlinus de Aeris & Alimenti defectu.

the Blood, when they might more eaſily have been imparted by the plain ſimple way of Transfuſion from the Arteries of the *Mother* to the Veins of the *Fœtus*. And, that this is the courſe which Nature takes in this caſe, I am perſwaded from the eaſineſs and ſimplicity of the Method, which readily performs what might be perhaps in vain expected from t'other, and wou'd over and above find 'em, what they ſeem to grope ſo blindly about for, a firſt Mover of the Blood in a *Fœtus*.

Thoſe that contend for the conveyance of a *Nutritious* Juice, thro the *Umbilical* Vein from the *Placenta*, are forc'd upon two difficulties next to Abſurdities. For firſt, they are oblig'd to make this Vein, which, as all other Veins, ſeems dedicated to the re-conveyance of Blood only, the proper and immediate Channel, thro which a very different Liquor is to be carried; and next to give a Power of Attraction or Suction to it; becauſe the *Nutritious* Juice, which it is thus deſtin'd to carry is both Viſcous and Stagnant, and has neither force to drive, nor ſubtilty to penetrate, or inſinuate it ſelf into the Capillary Veins; and therefore muſt be drawn or ſuckt as *Milk* is from the *Breaſt*, to which the *Placenta* and its *Nutritious* Juice are by the favourers of 'em expreſly compared. But if this were the ſole uſe of the *Placenta*, and *Umbilical* Veſſels, why were the Umbilical *Arteries* ſent along with the Vein? Their buſineſs is not to bring any thing back to the *Fœtus*, nor can they contribute any thing to the benefit of the *Mother*; for the *Uterine* Arteries bring all to the *Placenta*, the Umbilical Vein carries it to the *Fœtus*, and the *Uterine* Veins convey back again the Surcharge of the *Mothers* Blood; the Umbilical *Arteries* only, have nothing to do, and are ſuperfluous and impertinent, which is contrary to the conſtant practice of Nature. Yet if *Autopſie* did in the leaſt countenance this Hypotheſis, ſome defence might ſtill be made; but we find in the Umbilical *Vein* of a *Fœtus* nothing but *Florid* Blood, ſuch as in all probability it received immediately from the *Arteries* of the *Mother* without any mixture. And therefore I can't help concluding, that this opinion engages its favourers in ſome Abſurdity, without Neceſſity and without Proof.

They that from the *Placenta* ſupply the Body of the *Fœtus* with *Air*, are as much diſtreſs'd as t'other, for they are forc'd to beg the queſtion twice, which, even when granted, will not anſwer their ends. Firſt, they ſuppoſe, that an intimate mixture or confuſion of *Air* with the *Blood*, is neceſſary for the ſupport of Animal Life, a *Poſtulatum*, which perhaps the former part of this Diſcourſe may have render'd unneceſſary ; and next that the *Fœtus* is ſupplied with *Air* from, and its *Blood* mixt with it in the *Placenta.*

But here again they fetch a Compaſs without neceſſity or proof. For if a mixture of *Air* were neceſſary to a *Fœtus*, why ſhould it be ſeparated from the *Mothers* Blood, and not rather both communicated together, ſince it is ſo much more eaſie and commodious. But neither does the *Placenta* ſeem to be inſtructed and provided for the ſeparation of *Air*, but of a much *groſſer Fluid*, deſtin'd to ſome other uſe, which *Autopſie* confirms. Yet were both theſe opinions true, they are however defective, and the Circular Motion of the Blood unprovided for.

By the way of *Transfuſion* this great Phænomenon is naturally accounted for, and the ends, for which the other two Hypotheſes were deviſ'd, might both be anſwered with more eaſe. For the *Hyſterick* Arteries tranſmitting their Blood immediately to the *Umbilical* Vein, may very eaſily tranſmit ſuch *Nutritious* Juices or *Aerial* Particles as are contain'd in the Blood, along with it, without depoſiting 'em by the way. By this means ſo much of the Impulſe of the Mothers Blood is preſerv'd, as ſuffices to maintain that languid circulation, which a *Fœtus* enjoys. For the Blood being driven thro' the *Arteries* of the *Uterus* into the *Umbilical Vein*, is convey'd directly to the *Sinus* of the *Porta*, and thence by a ſhort and direct paſſage thro' the *Cava* to the Heart; where paſſing thro the *Foramen Ovale* to the *Left* Ventricle, and thro the *Canalis Arterioſus* from the *Right* and *Pulmonary* Artery, it is all deliver'd without coming at the *Lungs*, to the *Aorta*, and from thence again by the *Umbilical Arteries* to the *Veins* of the *Uterus*, making a ſort of *Epicycle* to the main Circulation in the Mother.

As this Opinion is favour'd by the ſtructure and diſpoſition of the Blood Veſſels on both parts, ſo there is nothing in it difficult to be conceiv'd, or repugnant to experience. Late diſcoveries have made it appear, that the Arteries and Veins are continued Tubes, and that the latter contain nothing but what they receive from the former, and no reaſon appears why we ſhou'd think this Method to be varied in the *Placenta*. On the other hand, if the Arteries of the *Uterus* were continued to the Veins of the *ſame* part, and thoſe of the *Fœtus* in like manner, without communicating with each other, their confluence in the *Placenta* ſeems to be altogether impertinent and of no uſe, and the *Umbilical* Arteries and Vein fram'd for no other ſervice or purpoſe, than to give the Blood room for an idle Sally.

Thus the reaſonableneſs of this old Opinion may be vindicated, but the certainty of it reſts upon ſtronger proof. Mr *Cowper*, to whoſe happy Induſtry we owe the Confirmation of many Antient Diſcoveries, and the benefit of ſome new ones, has the honour to re-eſtabliſh this old, but long exploded Truth. For by pouring *Mercury* into a Branch of the *Uterine Artery* of a *Cow*, that went into one of the *Cotyledones* of the *Uterus*, he fill'd thoſe Branches of the *Umbilical* Veins, which went from that *Cotyledon* to the *Navel* of the *Fœtus*; which with a part of the *Uterus* he keeps prepar'd by him.

It wou'd be a weak objection, to alledge that the Obſervation and Experiment being made on the *Uterus* of a *Cow*, the inference wou'd not hold from thenee to a *Woman*, the one being *Glanduliferous*, and the other *Placentiferous*;

ſince ev'ry one of theſe *Cotyledones*, or *Uterine Glandules*, is in all reſpects a little *Placenta*, and all the difference between 'em is in number, name, and magnitude, Why *Ruminants* differ in this particular from other *Viviparous* Animals, is beſide the ſubject of our preſent Enquiry. But the great Flux of Blood which conſtantly follows upon drawing the *Placenta* from Women (which is frequently ſo great as to coſt 'em their Lives) is as plain a demonſtration to Reaſon of the *Continuity* of the Veſſels, as Mr *Cowper*'s Experiment is to the Eye.

I have heard it objected by very learned men, that if there were ſuch a *Continuity* of Veſſels, and ſuch *Transfuſion* of Blood, the *Fœtus* muſt neceſſarily periſh thro loſs of Blood, upon the ſeparation of the *Placenta* from the *Uterus*, but that on the contrary no viſible flux of Blood does follow while the *Fœtus* continues wrapt in the Membrane, in which condition it may be kept alive ſome hours. To this it may be anſwer'd, that the Circulation in the *Fœtus* being deriv'd from the Mother, may be ſuppos'd wholly to ceaſe upon the cutting off the communication between 'em, till it is again renew'd more forcibly by *reſpiration*. But if we allow the Motion already impreſs'd upon the Blood to be ſufficient to keep it going a little while, yet it muſt needs be ſo exceeding languid, that the meer reſiſtance of the external Air muſt be more than enough to hinder any Efflux of Blood from a *Fœtus* before Reſpiration. How long Life may be preſerv'd without an *actual* Circulation of the Blood, is a queſtion not of this place. But we have been convinc'd by many and notorious Obſervations and Experiments, that Life has been recover'd a long time after all tokens of Reſpiration, Circulation, or even Life it ſelf have diſappear'd, ſo that we can't think the firſt ſolution either impoſſible or improbable.

I expect to be told, that in the early days of *Geſtation* in *Viviparous* Animals there is no *Placenta*, or any Adheſion of the *Umbilical* Veſſels to any part of the *Mother*, and conſequently no ſuch *Transfuſion*; and that in *Oviparous* there is no *continuity*, or *communication* of Veſſels of any kind, during the whole time of *Incubation*.

But theſe Objections carry neither the Weight nor Difficulty along with 'em, that they may be ſuppos'd to do; for in thoſe days there is neither *Blood* nor *Blood Veſſels*, and conſequently there can be no *Circulation* of the Blood; and the *Embryo*, of what Species ſoever, is no more than a *Vegetable* at that time; nor does the *Fœtus* of any *Viviparous* Creature enjoy any *Circulation*, or ſhew any ſigns of Animal Life, till after thoſe Veſſels, as well as others requiſite to the Circulation, are compleated.

It muſt be confeſs'd, that *Oviparous* Animals are denied the Benefit of this Communication: But that want is ſufficiently compenſated by a peculiar Mechaniſm, which directly anſwers the ends of *Reſpiration*, and the *Preſſure* of the *Atmoſphere* upon the *Fœtus*. There is at the *Obtuſe* end of an Egg a ſmall Cavity fill'd with Air, which is the Succedaneous Inſtrument to the *Reſpiratory* Organs. For as ſoon as the Contents begin to be warm'd by the *Incubation* of the Hen, or *any analogous* Heat of *Furnace* or *Dunghil*, the ſeveral Humours of the Egg require a *Fermentative* Motion, and the *Air* contain'd in the *Cavity* or *Veſicle* at the *obtuſe* end of the Egg is rarefied, and the Veſicle extended and enlarg'd, and conſequently the other contents are compreſt; to which the *Fermentative* Motion naturally reſiſts. But both Bodies being as well *compreſſible* as *dilatable*, and both having an *Expanſive* Motion impreſt upon 'em by *Incubation*, the compreſſion and renitency will be mutual; but varied in degree, according as either, thro the variation of Circumſtances, ſhall prevail. By this means, an Alternation of Compreſſion and Dilatation will be produc'd in both anſwering the *Reſpiratory* Motion, by which a Motion will be communicated, which, as ſoon as the Organs by which it ſhou'd be regulated are compleated, will in the Body of the *Pullus* be *regular* and *circulatory*.

Fabritius ab *Aquapendente*, and after him our Great Dr *Harvey*, have aſſign'd divers uſes to this Cavity or Air Veſicle, the Extravagance of which have perhaps deterr'd others from enquiring ſo much into the Uſe, as the importance of it requir'd. But tho I can't agree to that *Perſpiration*, *Refrigeration*, and *Reſpiration*, which they make it the Inſtrument of, yet perhaps the *Air*, that was incloſ'd in that *Cavity*, may thro the augmentation of the Body of the *Pullus*, and its own *Rarefaction* (which is at laſt ſo great as to occupy half the Shell) break the *Membrane*, which ſeparated it from the *Pullus*, and thereby give ſo much *Reſpiration* as to form the *chirping Voice*, which is often heard before the breaking of the Shell, and with it give an Addition of Strength to enable it to break the Shell. But how it ſhou'd reſpire ſooner is to me inconceivable.

There are many Problems of great ſeeming difficulty, the ſolutions of which flow naturally from what has been laid down here: But intending to proſecute this Subject farther, and to treat of the Impediments of Reſpiration, and the conſequences of Reſpiration obſtructed or intermitted, I ſhall reſerve 'em for that opportunity, and content my ſelf here to attempt the *Harveyan* Problem only, which has given abundance of Authors ſo much perplexity.

That incomparable Philoſopher enquires, *Why a* Fœtus, *taken out of the* Uterus *with the* Membranes *entire, ſhall live in Water ſome hours without communication with the* external Air; *whereas if it be taken out and ſuffer'd once to breath, it can't afterwards ſurvive a moment without the benefit of* Reſpiration.

Granting the Fact to be as he has deliver'd it, which yet is not ſo in all caſes, the main difficulty is grounded on a Miſtake, which from the ſtating of the Queſtion I find this Great Man to have ſlipt into. For he thinks, that a *Fœtus* is ſooner ſuffocated after having once breath'd, than if it had not breath'd at all, and that by breathing it had contracted ſomething which render'd it more periſhable. *Idem tamen ſecundis exutus*, (ſays he) *ſi ſemel* aerem *intra* Pulmones *attraxerit, poſtea ne momentum quidem temporis abſq; eo durare poſſit, ſed confeſtim moriatur?* And preſently after, *Siquidem*

Harv. de Gen. Anim. Cap. de Partu.

conſtat, fœtum, poſtquam eum ſemel *hauſerit*, citius *ſuffocari*; *quam cum ab* illo prorſus *arcebatur*. The Dr, obſerving a *Fœtus* to live longer without Reſpiration, and to diſpence better with the want of Air while included in the Membranes entire, than it cou'd afterwards; infers thence, that the Air does in the firſt Act of Inſpiration impreſs upon the Lungs ſome quality, which renders it ever after more indiſpenſably neceſſary. But allowing his Obſervation, I muſt yet deny his Inference to be good: For, deprive a *Fœtus* of means of reſpiring, and then take it out of the Membranes, and it ſhall be as ſoon ſuffocated, as if it had reſpired before. This proves, that this Neceſſity of intercourſe with the Air by way of the Lungs is not the Offsſpring, but the Parent of Reſpiration, and that, that Learned Man was drawn into a Fallacy of *Non cauſa pro cauſâ*.

The reaſon of this Neceſſity is the preſſure of the External Air upon the Surface of the Body, from which it was defended by the interpoſition of the Membranes and the Humours contain'd, which are not ſo compreſſible, as the Body of the *Fœtus* itſelf. So ſoon therefore as the *Fœtus* is excluded, and expos'd to the immediate contact of the ambient Atmoſphere, the Veſſels and all the Cavities of the Body muſt neceſſarily be ſo compreſs'd, that the Fluids can't have room for Motion, and conſequently the *Fœtus* cou'd have no Life, if Nature had not contriv'd by the Motion of the *Thorax* to remove and admit that preſſure alternately, and thereby to impreſs a Motion on the Fluids, which is the Spring of Life. But this Motion of the *Thorax* being any way ſuppreſs'd, the equal preſſure of the Atmoſphere on all parts occaſions a total Ceſſation of Motion, which is Death.

I ſhall proſecute this Subject no farther now, nor trouble the Reader with any Apology, for diſſenting from thoſe great Men herein named: Becauſe, I hope, I have done it with Modeſty, and all the Reſpect due to ſo great Authorities, and have aſſign'd nothing which is not matter of Fact uncontroverted, or deduc'd from it by plain Mechanical Neceſſity.

III. *The*

III. *The Deſcription and manner of Uſing a late Invented Set of ſmall Pocket-Microſcopes, made by* James Wilſon; *which with great eaſe are apply'd in viewing Opake, Tranſparent and Liquid Objects: as the* Farina *of the Flowers of Plants,* &c. *The Circulation of the Blood in Living Creatures,* &c. *The* Animalcula in Semine, &c.

THe Uſe of Microſcopes is ſo well known, that it's as needleſs to attempt their Recommendation to the Inquiſitive, as it would be tedious to numerate their particular advantages in Natural Inquiries. No one who looks into the Intimate ſtructure of the regular Productions of Nature, but muſt readily confeſs our Eyes ſtand in great need of theſe Magnifying Opticks: Nor is it a little entertaining to find the excellent Mechaniſm and Beauty of Natural Objects appear more Finiſhed, by how much *They* are Magnified with good Microſcopes: On the other hand, what confuſion muſt it be to an *Atheiſt* (if there can be ſuch an one) to ſee the moſt Celebrated pieces of Art appear Courſe, Deform'd, and altogether more Unfiniſhed, by how much *they* are magnify'd.

The late Improvements made by *Magnifying Glaſſes* are not ſo much owing to the Making *Them* and Compoſing Microſcopes, as the Methods of applying Objects for the advantage of *Light*; in which I hope the following deſcribed *Inſtruments* will not be found inferiour to any yet made, at leaſt commonly ſold. Experience, as well as the Authority of the Excellent † *Dr Hook*, aſſures us, That Single Magnifying Glaſſes (when they can be uſed) are preferrable to Microſcopes, compoſed of two or more Magni-

† *In his Preface to his* Micrographia.

fying Glaſſes. It is far from my deſign to Diſcommend any ſort of Microſcopes now in Uſe, or to recommend thoſe I make, any further than they are found Uſeful by thoſe Inquiſitive Gentlemen who are pleas'd to have *Them* of me.

This *Set* of Microſcopes has *Eight* different *Magnifying Glaſſes*; *ſeven* of *which* may be *Uſed*, with two different *Inſtruments*, for the better applying *Them* to various Objects: One of theſe *Inſtruments* is repreſented Fig. 1. A A A, and is made of Ivory, it hath 3 thin Braſs Plats, E, E, and a Spring of Braſs H within it; to one of the thin Plats of Braſs is fixed a piece of Cork F, with a concavity G . . . . . both in the Cork and Braſs to which it is affix'd; In one end of this Inſtrument there is a long Screw, D: with a Glaſs, C, ſcrewed in the end of it: In the other end there is a hollow Screw, o o, wherein any of the Magnifying glaſſes are ſcrewed when they are to be made uſe of. The 8 different Magnifying glaſſes are all ſet in Ivory, 7 of which are ſet in the manner of Fig. IV. n. 4. The greateſt Magnifier is marked upon the Ivory wherein it is ſet with n. 1, the next n 2, and ſo on till n. 7: The 8th Glaſs is not marked, but ſet in the manner of a little Barrel Box of Ivory, as in Fig. II.

E E a flat *piece of Ivory*, whereof there are 8 belonging to this ſet of Microſcopes, (tho any one who has a mind to keep a Regiſter of Objects may have as many of them as he pleaſes) in each of *which* there are 3 holes f f f, wherein 3 or more objects are placed between two thin Glaſſes, or Talks, when to be uſed with the greater Magnifyers.

The other Inſtrument Fig. III. is made of Braſs or Prince's Metal, with Joynts p p p p, to turn eaſily any way with a ſmall pair of Tongs G G, which open at the points k, by preſſing together the two heads of the Pins I I for taking up of Objects: There's a round piece of Ivory, H, ſcrewed upon the other end of the Tongs, white on the one ſide for black objects that are opake Bodies; (ſuch as Seeds or

Sands) and black on the other ſide for white ones of that nature.

Upon the ſharp end, A, of this Braſs Inſtrument all the 8 Glaſſes may be fixed, as you ſee Fig. IV. n. 4, there being a hole in the Ivory wherein the Glaſſes are ſet for that purpoſe, with a thin piece of Braſs B in manner of a Spring, that holds it firmer: So when any Object is taken up in the points of the Tongs k, or laid upon the other end H, it may be very eaſily (as any one who ſees the Inſtrument will perceive) applyed to the true diſtance of any of the Glaſſes by the help of the Joynts p p p p, as alſo the Screw C, and Wheel D, which will bring the Object to the exactneſs of the *Center* or true diſtance, being regulated by a Spring E.

The uſe of the firſt mention'd Inſtrument, Fig. I. AAAA is thus: Take one of your Flat Pieces of Ivory E E or *Regiſters*, (if you pleaſe to call them ſo) and ſlide it in betwixt the two thin Plats of Braſs E E in the body of the Microſcope, ſo that the Object you intend to look upon be juſt in the middle, remarking that you put that ſide of the Plate E E where the Ring is furtheſt from your eye: Then you are to ſcrew into o o, (the hollow Screw in the end of the body of your Microſcope,) the 3d, 4th, 5th, 6th or 7th Magnifying-Glaſs; which being done, while yᵉ are looking thro your Magnifying Glaſs upon the Object, you are to Screw in or out the long Screw D in the other end of the body of your Microſcope, till you bring your Object into the true Diſtance, which you will know by ſeeing the Object Clearly and Diſtinctly: But ſeeing that in the greater Magnifyers you can ſee but a ſmall part of the Object, *viz.* the Legs or Claws of a Flea; while you are looking upon any part of the Object, if ye take hold of the end of the Plate E E, whereon the Object lyes, and move it gently, you may ſee the whole Object ſucceſſively, or any part of the Object you pleaſe; and if that part of the Object you deſign to look upon be out of the true Diſtance, remember your End

Screw D, can always bring it in, by ſcrewing it nearer or farther off.

After this manner may be ſeen all tranſparent Objects, Duſts, Liquids, Cryſtals of Salts, ſmall Inſects, ſuch as Fleas, Mites, *&c.* If they be Inſects that will creep away, or ſuch Objects as one intends to keep, they may be placed between the two *Regiſter Glaſſes* f. f. For by taking out (with the point of a Pen-knife) the Ring that keeps in the *Glaſſes* f f where the Object lyes *they* will fall out of themſelves; ſo you may lay the Object, between the two hollow ſides of *them*, and put the Ring in as it was before: But if the Objects are Duſts or Liquids, a ſmall drop of the Liquid, or a little of the Duſt laid on the outſide of the Glaſs f f, and applyed as before, will be ſeen very eaſily.

As to the Firſt and Second Magnifying Glaſſes, being marked with a Croſs upon the Ivory wherein they are ſet, they are only to be uſed with thoſe *Regiſter Plats* that are alſo marked with a croſs, wherein the Objects are plac'd between two thin Taliks, becauſe the thickneſs of the Glaſſes in the other Regiſters or Plates hinders the Object from approaching to the Center or true diſtance of theſe Greater Magnifyers. But the manner of uſing them is the ſame with the former. Only remember to be careful when you put in or pull out the Plate or Regiſter E E, whereon the Object lyes, or move it from one Object to another, not to let it rub your Magnifying Glaſs, which is done by unſcrewing a little the End Screw D, when ye put in or pull out your *Plate*, or move *it* from one Object to another.

For ſeeing the Circulation of the Blood at the Extremities of the *Arteries* and *Veins*, in the tranſparent parts of Fiſhes, Eels, *&c.* there are two Glaſs Tubes, the one bigger, and the other leſſer, as deſigned in g g, wherein the Fiſh is to be put; when this leſſer Tube is uſed, ye are to unſcrew the End Screw D in the body of the Microſcope, until the Tube g g can eaſily enter into that little cavity G of the Braſs Plate, faſtned to the Cork F, under the other two thin Plats of Braſs EE: When the Tail of your Fiſh lyes flat to the Glaſs Tube, ſet it oppoſite to your Magnifying glaſs, and by ſcrewing in or out your End Screw D, as is ſaid before, you may eaſily bring it to the true diſtance, and ſee the Blood circulate with great pleaſure.

When the Bigger Tube is to be uſed with a larger Fiſh, or Frog; then you are to take out the *Braſs Plate* G F faſtned to the Cork, by preſſing down the other two Plates E E and the Spring H to the end of the Microſcope B; and by turning the Cork and Braſs Plate G F ſideways, you may eaſily either take it out and put it in again; when the Cork-plate G F is out, the larger Tube will eaſily enter into the body of the Inſtrument, and is to be uſed as the other leſſer one.

If you would ſee the Blood *Circulate* in a Frog's Foot, chooſe ſuch a Frog as will juſt go into your Tube, then with a little Stick, *&c.* expand the *Hinder foot* of the Frog, and apply it cloſe to the ſide of the Tube, obſerving that no part of the Frog hinders the Light coming on its Foot, and when you have it at the juſt diſtance, by means of the Screw D, as aboveſaid, you will ſee the rapid Motion of the Blood, in its Veſſels, which are very Numerous, in the Tranſparent thin Membrane that's between the Frogs Toes: For this Object the 3d and 4th Magnifyers will do very well; but you may ſee the Circulation in the Tails of *Water-Newts* with the 5th and 6th Glaſs, by reaſon the Globules of the Blood of thoſe Newts are as big again as the Globules of the Blood of Frogs or ſmall Fiſh, as has been taken notice of by Mr *Cowper* in N. 280. of theſe Tranſactions, pag. 1184.

N. B. The *Circulation* cannot be ſo well ſeen by the 1ſt and 2d Magnifyers, becauſe the thickneſs of the Glaſs wherein the Fiſh lyes hinders the Approx.

The Glaſs, plac'd in the manner of a Barrel Box, Fig. II, is only to be uſed with the Braſs Inſtrument (or in your Hand) being the leaſt Magnifyer, for greater Objects, ſuch as Flys and common Inſects, *&c.* The hole (a) in the ſide of this Box fig. II. is to be fix'd on the point A of the Braſs Inſtrument, remembring to put the end (b) next to your Eye, and the other to the Object; ſo if you take up any Inſect in the point of the Tongs k, or lay any opake Object on C the other end, you may approach them to the true diſtance by help of the Joynts and Screw ſpoken of before C. D, P E, and ſee them diſtinctly.

In the viewing of *Objects*, one ought to be careful not to hinder the light from falling upon *Them*, by the Hat, Perruke, or any other thing, eſpecially when they are to look upon opake Objects: for nothing can be ſeen with the beſt of Glaſſes, unleſs the Object be in a due diſtance, with a ſufficient light.

The beſt Lights for the Plats or Regiſters, where the Object lyes between the two Glaſſes, is a clear Sky light, or where the Sun ſhines on any white thing; or the reflection of the light from a Looking-glaſs. The light of a Candle is likewiſe good for the circulation of very ſmall Objects, tho it be a little uneaſie to thoſe who are not practis'd in Microſcopes to find out the light of the Candle.

By what is here ſaid, it's hop'd that the uſe of this Microſcope, eaſie of it ſelf, will be much eaſier to thoſe that uſe it; yet it cannot be doubted of *This*, as of all other Inſtruments of this nature, but that *Uſus plura docebit.*

For the conveniency of thoſe who would *Draw*, or make any *Sketches* or *Deſigns* after Microſcopical Objects, I have alſo made a Pedeſtal to fix the Two *Inſtruments* above deſcribed, and make them ſtationary to any convenient Light. This Pedeſtal may be placed on a Table, *&c.* and after the Object and Light are fixed, as many perſons as pleaſe may view the Object, without any trouble or difficulty in finding the Light.

The reſt of the annexed *Figures* were Drawn by this Microſcope from ſeveral *Objects*.

A, B, C, D, E, F repreſent the Feathers of the Wings of Butterflys and Moths; A, B, are the ſame, but differently magnified. A, was expreſs'd by the 4th Glaſs, and B, as it appear'd by the firſt. The reſt, being taken from different parts of thoſe Inſects, C, D, E, F, were all viewed by the 4th Glaſs.

G is one grain of the *farina* of the *capilaments* of Maloes, by the firſt Glaſs. H, H, is the Tail of a ſmall Fiſh, viewed when living by the 4th Glaſs, i i i i is the part of the Tail next to the Body of the Fiſh, where the Trunks of the *Veins* and *Arteries* paſs together. I I I I their extremities, which appear united. k k k other inoſculations, with the *Arteries* and *Veins* appearing in the tranſparent Membrane, between the Cartilages K K. L L L L the Cartilages compoſed of ſeveral Joynts, on each ſide of which the Trunk of a Vein and Artery paſſes. M an *animalculum*, whereof a great number appeared moving themſelves up and down on the Tail of the Fiſh, while the *Circulation* was a viewing. N a ſide view of the ſame *animalculum*.

O another *animalculum* of a different figure from the former, that ſtuck to the Tail of the Fiſh by its jagged extremity, and frequently drew its long Body out and in again.

P Q one of the Lice found on that Betle, called *Scarabeus Pediculoſus* by the 4th Glaſs. P Its *Anus*. Q Its two Claws, not unlike thoſe of a Lobſter. r r r r the extremities of its Feet, which have a remarkable contrivance for ſticking faſt to the poliſh'd ſurface of the Betle, not in the manner of Claws, as many other Inſects; but divided into Capilaments, as expreſſed in the Figure.

IV. *Part of a Letter from the Reverend Mr* Abraham de la Pryme, *F. R. S. to the Publiſher, concerning a Spout obſerved by him in* Yorkſhire.

Thorn, July 29. 1702.

HAving obſerved in the Tranſactions for *January* laſt, Mr *Stewart*'s Ingenious Account of ſome Spouts that he beheld in the *Mediterranean* Sea; it brought into my mind the memory of one that I ſaw, and was very near in this Country ſome years ago, which having then committed to Paper, I ſhall now preſent you with the relation of.

On the 15th of *Aug.* 1687. about two in the afternoon, appeared a Spout in the Air, in the Pariſh of *Hatfield*; upon the noiſe of which I immediately ran to the view thereof, and found it about a mile off, coming directly to the place where I was; upon which I took my Proſpective Glaſſes, and made the beſt and niceſt Obſervations thereon that I could.

The Seaſon was very dry, the Weather extreme hot, and the Air very Cloudy, the Wind aloft and pretty ſtrong; and (that which is moſt obſervable and moſt material) blowing out of ſeveral quarters at the ſame time, and filling the Air hereabouts with mighty thick and black Clouds, layer upon layer; the Wind thus blowing ſoon created a great *Vortex*, Giration, and Whirling amongſt the Clouds, the Center of which ever now and then dropt down in the ſhape of a thick long Black Pipe, commonly call'd a Spout; in which I could plainly and moſt diſtinctly behold a Motion, like that of a Screw, continually drawing upwards, and Screwing up (as it were) whatever it touched. In its progreſs it moved ſlowly over a Hedge Row and Grove of young Trees, which it made bend like Haſel Wands, in a Circular Motion ; then going forward to a great Barn, it did in a minute twitch off all the Thatch, and fill the whole Air therewith. Coming to a very great Oak Tree, it made it bend like the aforegoing, and broke one of the greateſt and ſtrongeſt Branches thereof, that would not yield to its fury, and twiſting it about, flung it a very conſiderable diſtance off. Then coming to the place where I ſtood, even within 300 yards of me, I beheld with great ſatisfaction its odd Phœnomenon, and found that it proceeded from nothing at all but a Giration of the Clouds, by contrary Winds meeting in a Point or Center, and then and there where the Greateſt Condenſation and Gravitation was, falling down into a Pipe or Great Tube (ſomewhat like the *Cochlea Archimedis*) and that in its Working or Whirling Motion either ſucks up Water, or Deſtroys Ships, *&c.* having travell'd about a quarter of a mile farther, it then Diſſolved by the Prevalency of the Wind that came out of the Eaſt.

V. *Part of two Letters from Mr* Henry Vaughan *to the Publiſher, containing ſome uncommon Obſervations made upon the Diſſection of ſome Morbid Bodies.*

A Gentleman about a month before *Chriſtmas* eat ſome common Prunes, about two pound, or more, and about a month or five weeks ago, he eat about a pound more: About a fortnight before he dyed I found, according to his complaint, that he had ſome ſymptoms of the Stone. He had a violent pain in the neck of his *Veſica*, and about the *Urethra*, with obſtructions in his Urine, *&c.* I ordered him a Terebinthinate Clyſter, which gave him eaſe; but ſeeing his pains increaſed, I adviſed him to a Phyſician: He made uſe of one of his acquaintance, he likewiſe preſcribed Clyſters, with Diureticks and Narcoticks, to no purpoſe. Upon his death, I obtained leave of his Relations to Diſſect him; accordingly I did with the help of a Surgeon, Dr *Weſt* being preſent, with ſeveral others of the deceas'd Patient's friends. I found upon the Diſſection the Prune-ſtones paſſed into the *Inteſtinum rectum*, and had there made a perforation, or rupture into the *Pelvis.* We tyed one part of the Gut, and cut out apiece, and emptied it: There was taken out 128 Prune-ſtones in number, beſides what we left behind *inſtercore*, in the other part of the *Inteſtinum Rectum.* There was likewiſe a large *Polypus* taken out of the Left Ventricle of the Heart, *&c.*

London, June 11. 1702.

S I R,

YOur kind reception of the laſt, encourageth me to give you a further account of a Youth in your Neighbourhood, who I attended about 30 hours; his Caſe was the *Iliaca paſſio*, very terrible for the time; he was aged about 14 years,of a Sanguine Conſtitution. About 3 or 4 hours before he dyed I adminiſtred a Terebinthinat Clyſter, which gave, during its ſtay, immediate eaſe; he ſo continued about an hour, then his Diſeaſe returned again as ſevere as ever: He ſoon after dyed: but before, ſome time he voided ſome of his Clyſter by Vomit. The Caſe being not very uſual, I applyed my ſelf to his Friends, in order to Diſſect him; which accordingly I did the next day. Finding the Liver only ſomething larger than ordinary, I immediately made ſearch from the *Ventriculus* quite to the lower end of the *Inteſtinum rectum*: The *Ventricle* was conſiderably extended, a little ſpace from the Gut *Ileon*, in the *Jejunum*, I found the excrements had made a breach, and ſome quantity was evacuated. I then proceeded to the Gut *Ileum*, I found a conſiderable part of it very livid, not in the leaſt extended; the Colon was much like a Contuſed Wound about 3 or 4 days old. I inſpected into the center of it, where I found it ſomething freſher, not ſo livid as the outſide. About the beginning of the *Inteſtinum rectum* I found another large ruption, where there was more excrements voided. There was ſome other ſmall matters to be ſeen, not worth while for me to mention to you. However, Sir, this being matter of fact, as a great many of his Relations can teſtifie,they being preſent,I thought fit to acquaint you with it. About 18 months ago I diſſected a poor

Emaciated Creature, that dyed of a *Hydrops*, out of whom I took about 10 Gallons of Liquor meaſured: and about a month ago a Child which had an Involution of the Inteſtines; which, I believe, the Vulgar means, and calls the Twiſting of the Guts.

Printed for *Sam. Smith* and *Benj, Walford*, Printers to the Royal Society, at the *Princes Arms* in *St Pauls* Church-yard, 1702.

ADVERTISEMENT.

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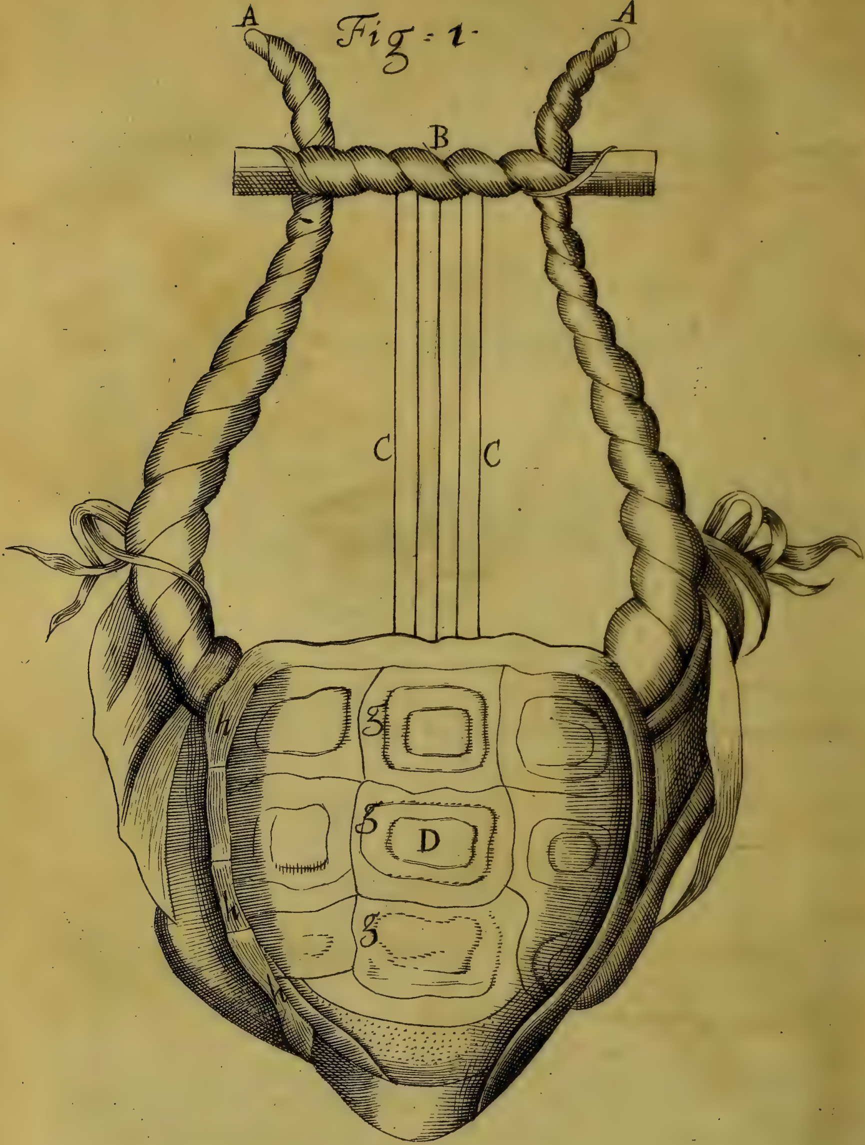
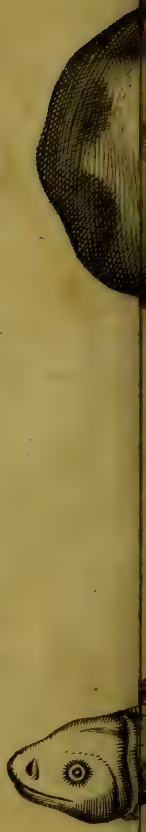
BRITISH MUSEUM NATURAL HISTORY

Fig: 1.





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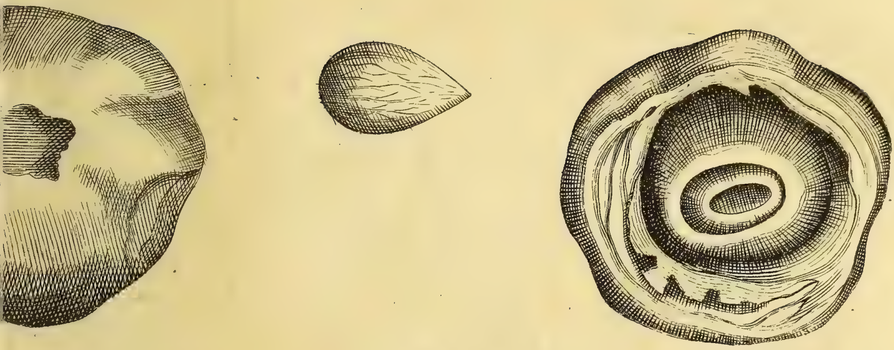

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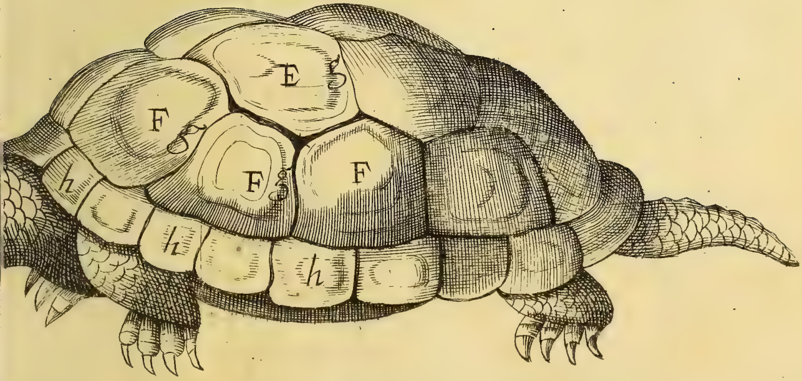

BRITISH MUSEUM NATURAL HISTORY

(Numb. 282.)

PHILOSOPHICAL TRANSACTIONS.

For the Months of November *and* December, 1702.

The CONTENTS.

I. *Some obſervations on Coral, large Oyſters, Rubies, the growing of a ſort of* Ficus Indica, *the Gods of the* Ceilaneſe, &c. *made in* Ceilan, *by Mr* Strachan.

II. *Mr* Sam. Brown *his ſeventh Book of* Eaſt India *Plants, with an* Account *of their* Names, Vertues, Deſcription, &c. *By* James Petiver, Apothecary, *and* Fellow *of the* Royal Society.

III. *A Letter from Dr* Thomas Molyneux, *F. R. S. to the Right Reverend* St George, *Lord Biſhop of* Clogher *in* Ireland, *containing ſome Thoughts concerning the Ancient* Greek *and* Roman Lyre, *and an Explanation of an obſcure Paſſage in one of* Horace's *Odes.*

IV. *A Letter from Mr* James Yonge, *F. R. S. to Dr* Edward Tyſon, *F. R. S. concerning a Ball, extracted from a perſon, who had ſuffered by it* 30 *years, in which was a Plumb-ſtone.*

V. *Some inſtances of other perſons who were hurt by ſwallowing Plumb-ſtones, by the Publiſher.*

VI. *A Letter from Mr* Thoresby, *F. R. S. to the Publiſher, concerning the* Veſtigia *of a* Roman *Town lately diſcovered near* Leedes *in* Yorkſhire.

I. *Some obſervations on Coral, large Oyſters, Rubies, the growing of a ſort of* Ficus Indica, *the Gods of the* Ceylaneſe, &c. *made in* Ceilan, *by Mr* Strachan.

THere is great quantity of a kind of white Coral upon the ſhore betwixt *Gale* and *Mature*, and many other Coaſts in the *Indies*, of which the *Hollanders* cauſe Lime to be burnt for building of Houſes, and the Walls of the Fortifications. There are great Banks of the ſaid Coral, it is porous, neither ſo firm and ſmooth as the upright, which grows in little Branches, and when they are come to the full growth, there grows other betwixt theſe, and then upon theſe grows others, until it is become like a Rock for thickneſs; theſe Branches are not ſofter when they are young, than when they are ripe, yet I have obſerved a ſlime upon them always when they are under water, which I ſuppoſe is the ſubſtance which petrifies, I have ſeen three Leagues from *Batavia*, upon that Iſland, where the *Hollanders* turn up the keel of the Ships to dreſs and mend them, Oyſters of a foot Diameter, the Shell of one of theſe did grow until it was 3 foot of Diameter broad and a foot thick, after the Fleſh was putrified, upon theſe Shells lying only 3 or 4 foot under water, I alſo always did find a ſlime. Upon the Coaſt betwixt *Gale* and *Gindere* lies always *Os Sepiæ*, and in the River at *Catoene* there are found Rubies, and if one is deſirous, and ſeek among the Sand in the Water, he will find above a drop weight of Rubies in the ſpace of one hour, but they are very ſmall, for 20 of them will ſcarcely weigh a grain weight, ſo that it is not worth a mans while.

Upon the Sea Coaſt upon the Sand do lye a kind of little Cockles of the bigneſs of Crabs Eyes or *Oculi Cancrorum*, there is no cavity within, if beat in Powder they have the ſame effect as *Teſtaceous* Powders, and are uſed inſtead of *Oculi Cancrorum.*

There are ſeveral Trees, one of which will be above 6 fathom high, whoſe Root (I may ſay) grows above ground, after the following manner, when the Twig is about one half foot high above Ground, there grows out of the middle of the ſtem a little knot which grows downward, making an angle with the ſtem of 30 Degrees or thereabout until it touch the Ground, then it fixes in the Ground, ſending forth ſmall Sprigs, which before it touched the Ground had neither Branch nor Leaves, but all over green even like a ſhoot. While this ſhoot grows and the Stem grows higher, it ſtill ſhoots forth other ſhoots, which always comes out of the middle of the Tree or Trunk; thus it continues ſhooting forth theſe ſhoots, until the Tree be at his full growth, and the higher the Trees grow, the knots and the ſhoots are the thicker and longer, ſo that one of the ſhoots which grows laſt, will be a foot thick of Diameter, and 3 fathom long.

Now the Flower which is called *Happumal* grows upon a Tree that grows after this manner, and grows only two fathom high, if they be planted round about an Orchard they are an excellent Hedge, for the Leaves are thorny and full of pricks, when the Flower decays it carries a Fruit like a Pine-apple, but is for no uſe.

Some Naturaliſts affirm all Plants to have a Heart, or ſomething analogous to it; it would be worthy the enquiry in what place the Heart of theſe kind of Trees is, as alſo the Palmito and Coco tree.

It is very difficult to know which of theſe two have a greater reſpect given to them, the *Budun* or *Sakradewendra.*

Sakradewendra commands and governs all the reſt of the Gods and did hear formerly the Prayers that were offered up to him from diſtreſſed People here upon Earth, and did grant their requeſt, but now the Golden Chair whereupon he uſed to ſit is gone, and the Prayers which are offer'd up to him now have no effect, becauſe the foot of that Chair was made of a kind of Wax, which would turn ſoft by the Prayers and Tears of the Supplicators, and would ſink downward, by which means the *Sakradewendra* would look down and take notice of the Prayer of the Supplicant and grant their requeſt.

This Chair being of fine Gold was deſtributed among the poor, which is the cauſe wherefore he does not now perceive or know when any man makes Supplication to him, therefore there are but few People that has any benefit of the Prayers and Tears which they offer to him.

He can indeed look far when he turns his Eyes towards any place, for his Forehead reſembles the Peacocks Tayl, it is ſo full of Eyes, and ſo ſometimes it chances that he looks down and takes notice of men, but this is but ſeldom, therefore there is a neceſſity for one to pacify theſe wicked Spirits which trouble us here on Earth. I could never underſtand of them how long this *Dewendra* had been a God, or how long he would Reign, for none trouble their Heads to regard him any more.

The *Budun* whereof the *Banapots* (or their Bibles, if I may call them ſo) makes great mention, has had the Life of all the Species of living Creatures that are in the World, having been firſt an Inſect, after his Death his Soul was regenerated into a Mouſe, after that an Ox, then a Monkey, and ſo forth, then a Man, and ſtill by his good Life and Merits was ſtill born in a better condition until, he is become the ſupreme of all the Gods.

Of the *Buduns* there has been 3, every one of theſe Reigns has been counted after this manner, there is a great Hill about half a mile of perpendicular height, and about ſix miles in circumference, from the Hill a certain Bird comes once in a thouſand year, and takes one grain to a certain place, and continues every thouſand years once, until he has removed that Hill to another place.

II. *Mr* Sam. Brown *his ſeventh Book of* Eaſt India *Plants, with an* Account *of their* Names, Vertues, Deſcription, &c. *By* James Petiver, Apothecary, *and* Fellow *of the* Royal Society. *Theſe* Plants *were gathered between the* 15*th and* 20*th of* June, *A. D.* 1696. *in the ways between* Fort St George *and* Trippetee, *which is about* 70 *miles off.*

249. Cora calunga *Malab.*

S. B. 7. 249. TRaſi *Orientale* radice Olivari. *an.* Cyperus rotundus *Orientalis* major *C. B.* 13. 1. *Theatr.* 208. c. 12. 1. *H. Ox.* Sect. 8. pag. 236. 2. *Tab.* xi. *Ser.* 1. *Fig.* 2. This Plant is ſaid to be in *Rawolphs* Collection: Dr *Plukenet* alſo in his *Almageſt.* p. 127. 8. pretends to have it. The *Roots* of this next the Leaves are fibrous, to which lower adhere others as it were *Neck-laced* and *Strung*, which are oblong like thoſe of *Drop-wort.* The *Leaves* are long and narrow, its *Panicles* are Greeniſh mixt with Red, theſe are frequently proliferous, yet ſeldom more than 4 or 5 *Cocks-foot-like* ſpikes, at the end of each ſlender pedicle.

N. B. I diſtinguiſh all thoſe *Cyperuſes* by the name of *Traſi* as have compreſt ſquamoſe panicles, like the *Gramen Filiceum*, *Amorettes* or *Gr. Amoris*, whoſe leſſer ſpikes grow very like ſome of our *Dactylons.* This is *Cyperus-graſs*, the Natives give the Decoction of the *Root* in *Fevers*, *Jaundice* and *Obſtructions* of the *Liver*, here are many *Species* of it, *S. B.*

250. Comachee pillee *Malab.*

S. B. 7. 250. Squinanth. or Camels Hay *Angl.* Juncus odoratus *Lat.* Σχοῖνος ἀρωματικος *Grec.* Schænanthum *Officinis*, *Belgis* & *Italis.* Camdiſchheuu *Germ.* Paſteure de Chameau *Gall.* Adhar & Adhir *Arab.* Sachbar *Arabiæ* incolis. Giunco Odorato & Squinantho *Ital.* Paya de la Mequa *ſive* Paya de Chamellios *Hiſp.* Palea de Mecka & Paſtus Camelorum *vulgo.*

Schænanthus *odoratus* Officinarum *nobis.* Schænanthe *Pomet.* lib. *6.* p. 173. *cap.* 1. Fig.

Schænanthos *ſive* Juncus odoratus *I. B.* v. 2. l. 18. p. 515. c. 223. Fig. *Cabr.* 196. Fig. 1.

Schænanthum *Ger.* 39. Fig.

Schænus *Cord.* in *Dioſc.* p. 4. c. 16. Schænus *ſeu* Schænuantus *Cord.* Hiſt. 199. c. 54. *Fig.* mala 200.

Schænanthus & Juncus odoratus *Offic.* Dale 374. 3.

Schænanthus *Ray* H. Pl. 1310. c. 4.

Giunco odorato *Durant.* 212. Fig. 1.

Gramen Dactylon *Maderaſpatenſe*, cum pluribus ſpicarum paribus ad ſummum caulis velut in verticillas poſitis *Pluk.* Tab. 119. Fig. 2. *Alm.* Bot. 175. 6. Gramen ad Junceum accedens aromaticum majus *Syriacum* H. Ox. *Sect.* 8. p. 229. *Tab.* 9. Fig. 25. Gramen *Dactylon* aromaticum, multiplici panicula, ſpicis, brevibus tomento candicantibus ex eodem pediculo binis *Pluk.* Tab. 190. Fig. 1. *Alm.* Bot. 175. 5,

Juncus *odoratus* C B. *in* Matth. 56. Fig. *Cluſ.* Exot. 203. c. 34. Fig. *Fragos.* 60. c. 28. *Garz.* 137. c. 34. Juncus *odoratus* tenuior *Park.* 144. Fig. Juncus *odoratus* ſive *aromaticus* C. B. 11. 1. *Juncus* Odoratus *ſive* Aromaticus qui *Squinanthum* Officinis quaſi χοινȣ ἄνθος Junci flos *C B.* Phyt. 31. 12. Juncus odoratus *ſive* Schænanthos *Ad.* 42. Juncus rotundus aromaticus *C B.* Theat. 163. Fig.

I take the *Codipulu* of the *Hort.* Malab. *Vol.* 12. *Tab.* 57. p. 107. to be a Species of this, if not the ſame, the *Figure* pretty well agreeing with it, particularly the *ſeparate Squamæ* and *Flowers*, which are expreſt towards the bottom of the *Table* on the left hand, and farther to confirm it in the *Deſcription*, there is notice taken, that its *Leaves* are of an *Aromatick* ſcent.

Pluk. Tab. 119. *Fig.* 2. *& Tab.* 190. *Fig.* 1.

Dr *Plukenet* has needleſsly *Figured* this Plant twice over, ſince his firſt *Figure* (which was from a Specimen I gave him) is much truer than the laſt, *viz.* Tab. 119. *Fig.* 2. & Tab 190. Fig. 1.

This is *Schænanth*, which the *Natives* here have not in great Eſteem, ſometimes in the *Moors Camps*, the *Horſes*, *Camels* and *Oxen*, which carry burthens eat nothing elſe, it's generally 2 or 3 foot high, here about, but near *Color* in rich Soyl, I have ſeen it 8 foot high, and thick as a Quill or ſmall Reed: It's ſometimes by the *Natives* put into their *Decoctions* for *Fevers*, and is good for *Coughs* and *Thruſh* in Children, and with us is deſervedly of more eſteem. *S. B.*

251. Vettever *Malab.* S. B. 7. 251.

Gramen *Madraſpatanum* majus, cujus locuſtæ ſpinulis armatæ ſunt. *Muſ. Petiver.* 559.

Theſe *Roots* are very long, fibrous and whitiſh, of a fragant ſmell whilſt freſh, the *Leaves* are long, ſtiff and flag-like, but narrow; its *Panicle* is Reed-like but not downy, compoſed of many ſlender *Spikes*, each compoſed of ſmall rough, or rather ſerrated ſquamæ.

The *Natives* uſe a *Decoction* of the *Root* for *Fevers*, *Rheumatiſms*, *Janne*, &c. S. B.

251. a. Vaſna pille *Malab.* S. B. 7. 251. a.

Gramen *Citratum* fragantiſſimum *e Madraſpatan.* Muſ. *Petiver.* 586.

Dr Plukenet makes this a *Cyperus graſs*, but for what reaſon I know not, having as yet ſeen nothing but its Leaves.

This is a moſt delicate ſort of *Fragrant Graſs*, which being rubb'd, ſmells like *Baume* and *Lime* or *Limon-peel* together. The *Portugueſe Women* fume their Children with it, and give the Decoction of it with other things for *Fevers*, and to ſtrengthen weak Stomachs; but the *Natives* uſe it not, which together, with its growing in *Gardens* on the Sea Coaſt, and not up the Country, as I can yet obſerve, makes me think the *Portugueſe* brought this from other parts and planted it here; certainly ſo excellent a Plant of ſuch *Fragrant* and *Aromatick taſte* muſt have many *Vertues*. I uſe it in many caſes, and generally with ſucceſs. While I was writing this, in came a Perſon, who ſays, that about 30 years ago, *viz.* about 1666. one *Antonia Palia* brought 3 Pots of this *Graſs* from *Batavia* to *Paliacut*, one of which he ſent to a *Garden* here at *Madraſs*.

252. Neer chenden nelle *Malab.* Rice *Anglis* Arz *ſeu* Arzi *Arab.* Reys *Fl.* Ris *Gall.* Reiſz *Germ.* Ορυζα *Græc.* Atroz *ſeu* Arroz *Hiſp.* Riſo *Ital.* Oryza *Lat.* *Oryza* vulgaris ariſtata *nob.* S. B. 7. 252

Oryza *Ad.* 12. *Aug.* 98. *C B.* in *Matth.* 326. c. 88. Fig. *C B.* Phyt. 52. C B. *Theatr.* 479. c. 29. Fig. *I B.* V. 2. l. 18. p. 451. c. 48. Fig. I B. *prodr.* 50. p. 35. *Bod.* 362. *Brunſ.* Tom. 2. app. p. 15. *Cam.* Hort. 113. pl. 6. *Chabr.* 174. Fig. 4. *Cord.* in *Dioſc.* 42. c. 117. *Dioſc.* Ind. 37. *Phil.* 35. Dod. *Pempt.* 509. c. 28. Fig. *Ger.* 72. c. 52. Fig. *Ger.* emac. 79. Fig. *Cat. Pl.* Jam. 24. *Lacun.* 185. *Lob.* Icon. 38. *Lob.* 23. Fig. 3. *Lonic.* in *Dioſc.* 34. l. 2. c. 85. *Lugd.* 407. l. 4. c. 16. Fig. *Matth.* 254. l. 2. 88. Fig. *Munt.* 4to 551. c. 346. *Munt.* Hiſt. & *Phyt.* curioſ. 797. c. 366. H. *Oxon.* Sect. 8. p. 201. c. 15. 1. Tab. 7. *Ser.* 3. Fig. 1. *Park.* 1136. c. 22. Fig. *Ray* H. Pl. 1246. c. 6. *Ryff* in *Dioſc.* 232. pro 132. l. 2. c. 87. *Tabern.* 676. Common bearded Rice.

253. Chenduppee Corea. *Malab.*

S. B. 7. 253. *Cyperus* Madraſpatanus *Allij* capitulo. *an.* Pee Mottenga *Malab.* i. e. Mottenga *ſylveſtris.* Badera muſta *Bram.* H. *Mal.* V. 12. *Tab.* 53. p. 99. *an.* Cyperus fibratus, ſpicis ſubrotundis magnis ſingularibus folijs ſeſſilibus *H. Oxon.* Sect. 8. p. 228. 28.

This is diſtinguiſht from others, particularly from No 273. following, in having but one head and its *ſquama* large and turgid, the *Leaves* about it very long, narrow and ſeldom fewer than 4 or 5.

254. Arſee pillee *Malab.*

S. B. 7. 254. Panicum *Madraſpatanum* minus ſpica denſiore multiplici. *an* Gramen Paniceum *Curaſſavicum*, paniculis in ſpica longa diſpoſitis; *P. B.* pr. 337. This comes next to *Dr Plukenets* Gramen *Paniceum* multiplici ſpica *Maderaſpatanum* Phyt. *Tab.* 191. Fig. 1. but that the *Spikes* of this are thicker and ſtand cloſer together.

255. Aune Coodee *Malab.*

S. B. 7. 255. Cyperus *Madraſpatanus* maximus, ſpicis tenuibus, glumis *ſemini Santonici* ſimilis.

Each *Panicle* ſtands on longer or ſhorter footſtalks, ſome more than 6 inches from the baſis, others without any, theſe are compoſed of 6 or 8 ſpikes, ſurrounded with oblong ſquamoſe heads reſembling *Wormſeed*, by which it may be eaſily known from all others, the longeſt of theſe *Spikes* rarely exceeds 3 inches. From the baſis of the Panicle extend ſeveral *Flag like* leaves of different growth, *viz.* ſome more than an inch broad and 2 foot long.

S. B. 7. 256. 256. Palea muta coree *Malab.*

Muſ. Petiv. 796. Pluk. *Tab.* 221. *Fig.* 7. Randalia *Madraſpatana* Graminis folio globulifer *Muſ. Petiver.* 796. Scabioſa Graminifolia nudicaulis, capitulis argenteis. ſ. *Statice* minima *Maderaſpatana* Pluk. *Phyt.* Tab. 221. Fig. 7. *Alm. Bot.* 336. pl. 9.

This is neither a *Scabious* nor *Thrift*, but a peculiar Plant with a ſmall white globular head and Graſſy leaves.

S. B. 7. 257. 257. Vanamalle coddee *Malab.*

Cyperus *Madraſpatanus* minimus *Xanthoides* Muſ. *Petiver.* 598. *Muſ.* Petiv. 598. Inſt. *R. H.* 528. *pl.* ult. *an* Scirpus omnium minimus *Indicus*, capitulis villoſis *Inſtit. Rei Herb.* 528. pl. *ult.*? This is a very elegant, ſmall prolifick Graſs, the *Roots* ſhooting from one to another, 'tis full of ſmall Bur-like heads, generally one on a ſtalk, ſometimes two, and very rarely 3, it hath a ſhort beard from the Head and a longer above, *viz.* ½ an inch or thereabout.

258. Mautangee pilloo *Malab.*

Alopecuros *Malabarica* folijs undulatis ſpica prætenue. *Gramen* geniculatum brevifolium criſpum, ſpica purpuro ſericea *Maderaſpatanum* Pluk. *Tab.* 119. Fig. 1. *Alm. Bot.* 177. pl. 4. Alopecuros *Madraſpatana*, folio brevi criſpo, ſpica purpuro ſericea *Hiſt. Oxon.* Sect. 8. p. 191. 7. & Alopecuros *Indica* ſpica longiore nigricante *H. Ox.* S. 8. p. 191. 5. Tsjeria Kuren pullu *Malab.* Tana *Bram.* Hort. *Malab.* Vol. 12. Tab. 62. p. 117.

S. B. 7. 258. Pluk. *Tab.* 119. *Fig.* 1. H. Ox ſ. 8. p. 191. 5. H. Ox. ſ. 8. p. 191. 7. H. Mal. v. 12. *Tab* 62. p. 117.

This is eaſily diſtinguiſht from all others by its curl'd Leaves, and long ſlender bearded ſpike.

259. Narree pillee Malab.

Gramen *Paniceum* ſpica ſimplici levi *Ray* Hiſt. Plant. 1261. Its ſmooth, yellowiſh ſilken Ariſtæ or Beard, diſtinguiſhes it from the reſt with ſingle Spikes of this kind.

S. B. 7. 259. Ray *H. Pl.* 1261.

260. Naun ducal pillu *Malab.*

Panicum *Madraſpat.* perelegans ſeminibus perlatis *Muſ. Petiver* 560. This rare Graſs hath a fibrous Root and very hairy Leaves; it bears its Spikes from near the bottom to the top of its Branches, each are compoſed of ſmall round Poppy-like *Seed*, one above another, yet ſomewhat alternately, in ſome meaſure reſembling the Pods of *Ornithopodium* or *Birds foot.*

S. B. 7. 260. Muſ. Petiv. 560.

261. Tauta Correa *Malab.*

Juncus Madraſpatanus minor. *an* Gramen Junceum ſ. Juncus foliaceus humilis caule rotundo Maderaſpatenſis *Pluk.* Tab. 192. Fig. 6. & H. Ox. S. 8. p. 232. 19.

S. B. 7. 261. *Pluk* 192. *Fig*, 6. H. Ox. ſ. 8. p. 232. 19. S. B. 7. 282.

Some of theſe are a Span and ½ high, others but 3 inches from the *Root* which is fibroſe; its *Tufts* are compoſed of ſeveral oblong ſquamoſe thick *Heads*, theſe have no Leaves from its Tufts as No 282. The *Seed* is very ſmall and black.

262. Tune adde pille *Malab.*

Gramen *Madraſpat.* hirſutum glomerulis echinatis. an *Gramen* hirſutum *Indicum* glomeratis capitulis *Lagopi* æmulis, gluma e ſquamulis plurimis purpuraſcentibus ariſta unica donatis compactili *Pluk.* Tab. 190. Fig. 7. *H. Ox.* S. 8. p. 193. 26. & p. 224. 3. This is diſtinguiſhed from all others by its hairy *Leaves* and *Heads* ſomewhat like Bur Reed, but much leſs, or rather ſome of the *knotted Trefoil*, and from S. B. 4. 176. that being larger, and the Squamæ of its heads ſofter and cloſer, reſembling thoſe of the *Juncus* capitulis *Equiſeti*, C. B.

S. B. 7. 262. Pluk. *Tab.* 190. *Fig.* 7. *H.* Ox. ſ. 8. *p.* 192. 26. *H.* Ox ſ. 8. p. 224. 3. S. B. 4. 176.

S, B. 7. 263. 263. Kairupum bille *Malab.*

S. B. 7. 292. Dactylon *Madraſpat.* minus Arundinaceum folijs brevioribus teneris. This differs from S.B. 292. in having its Leaves ſhorter, broader and thinner.

S. B. 7. 264. 264. Poo-pillee *Malab.*

Muſ. Petiv. 61. Muſ. Petiv. 60. H. Mal. v. 12. Tab. 51. p. 95. H. Ox. ſ. 8. p. 185. 15. Marcgr. p. 1. 1. Under this *Malabar Name* is ſent 2 varieties of *Cocksfoot* Graſſes, *viz.* 1. Gramen *Dactylon Madraſpatanum* ſpicis villoſis flaveſcentibus ſpecioſis *Muſ. Petiver.* 61. The other *Gramen* Dactylon *Madraſpat.* ſpicis piloſis *Muſ. Petiv.* 60. *an.* Kouda pullu *Malab.* Tana *Bram.* H. *Mal.* Vol. 12. Tab. 51. p. 95. ? *an.* Gram. Dactylum *Indicum* ſpicis villoſis ſubrufeſcentibus *H. Ox.* ſ. 8. p. 185. pl. 15. Tab. 3. ſer. 2. Fig. 15. ? *an* Gr. *Dactylum* elatius ſpicis plurimis tomentoſis *Cat. Pl. Jam.* 33. *an* Graminis 1 ſpecies *Marcgr.* p. 1. ? This differs from the firſt in having browniſh ſpikes and ſhorter awns.

S. B. 7. 265. 265. Shanee Coree *Malab.*

Muſ. Petiv. 593. H. Ox. ſ. 8. p. 227. 8. H. Mal. v. 12. Tab. 54. 101. Cyperus *Filicinus* medius, panicula comoſa e *Madraſpatan* Muſ. *Petiver* 593. *an* Gram. *Junceum* minus *Indicum* ſpiculis plurimis parvis in capitulum digeſtis *H. Ox.* ſ. 8. p. 227. 8. ? *an* Mulen pullu *H. Mal.* v. 12. Tab. 54. p. 101. ?

Theſe *Panicles* grow in Tufts, never exceeding an inch from the Baſe, which is guarded with unequal *Leaves*, ſome above 5, others not one inch *long*: Its *Root* thready, and as it were hoary. It *grows* from ½ a Span to near 2 Foot *high.*

S. B 7. 266. 266. Chendu Correa Malab.

Juncus coniferus *Madraſpat.* major.

S. B. 7. 271. Pluk. Tab. 192. Fig. 5. S. B. 7. 300. *an* Gramen *Cyperoides* Madraſpat. caule compreſſo, ſparſa panicula Junci *Pluk.* Tab. 192. Fig. 5. ? This differs from No 271 and 300, in being much larger, taller and ſtalk flattiſh.

S. B. 7. 267. 267. Peacaramboo pu *Malab.*

Arundo *Madraſpat.* plumoſa flaveſcens.

This differs from the next in having much broader *Leaves*, and its *Panicles* leſs downy, and very full of ſmall *Seed*, with brown yellowiſh tips.

S. B. 7. 268. 268. Naunel pu *Malab.*

H. Ox. ſ. 8. p. 219. 8. H. Mal. v. 12. Tab. 46. p. 85. Arundo *Madraſpat.* panicula ſericea albiſſima.

an Arundo *Indica* cava H. Ox. ſ. 8. p. 219. 8. *an* Kerpa *Malab.* Bala *Bram.* H. Mal. v. 12. Tab. 46. p. 85. ?

Its *Leaves* are narrow, long and apt to convolute, or cloſe round the *Panicle* downy and very white, each ſingle ſpike much reſembling thoſe which lie in the *Codded Willow Herb.*

269. Maudu Corea *Malab.* S. B. 7. 269. *Muſ.* Petiv. 589.

Traſi *Madraſpat.* panicula ſpecioſa rufeſcente.

Cyperus longus *Madraſp.* panicula rufeſcente ſpecioſiſſima *Muſ. Petiver.* 589. This differs from 249, in having more elegant *Panicles*, thicker ſet and of a ruſty colour, each ſquamoſe head reſembles thoſe of the common *Amourets*, but are leſſer. S. B. 7, 249.

270. Calla pillee *Malab.* S. B. 7. 270. *Muſ.* Petiv. 574.

Schœnanthus major *Madraſpat.* glumis Roſeis *Muſ. Petiver.* 574. This is eaſily known from the other Schænanths in having hollow Oat-like husks, 8 or 10 together diſpoſed into a Roſe faſhioned tuft, each terminating pointed with a ſhort hair like ariſta or beard.

271. Coddane codee *Malab.* S. B. 7. 271. Pluk. *Tab.* 95. *Fig.* 3. *H.* Ox. *ſ.* 8. *p.* 238. 29.

Juncus coniferus minor *Madraſpatanus* capitulis rotundioribus. Juncus *Orientalis* panicula ſpecioſa e *Maderaſpatan* Pluk. Tab. 95. Fig. 3. *Cyperus* minor *Maderaſpatenſis*, panicula ſparſa e locuſtis rotundis compoſita *H. Ox.* ſ. 8. p. 238. 29. *an.* Gram. Luzon. 1. Camel. Mſ. in Delineat. ?

272. Pauni pille *Malab.* S. B. 7. 272.

Amourettes *Madraſpat.* criſtata minor, ſpica breviore viſcoſa. What is peculiar in this *Love-graſs* is its having juſt under each ſpike, its ſtalk clammy, as in the *Muſcipula* Lobelij or Lobells *Catch Fly.*

273. Mucutang Corea *Malab.* S. B. 7. 273. *Cat. Pl.* Jam. 36. 7. Pluk. *Tab.* 197. 7. *H.* Ox. *ſ.* 8. *p.* 232. 10. *H.* Ox. *ſ.* 8. *p.* 236. 7.

Cyperus *Jamaicenſis* fere tricephalus.

Gramen *Cyperoides* minus ſpica compacta ſubrotunda viridi, radice odorata *Cat. Pl. Jam.* 36. pl. 7. Juncellus *Madraſpat.* capitulis compactioribus, acumine bifido longiori Pluk. Tab. 197. Fig. 7. H. Ox. ſ. 8. p. 232. 10. an *Cyperus* rotundus *Indicus* capitulis ſubrotundis conglemeratis *H. Ox.* ſ. 8. p. 236. 7. ? *an* Malobotones *Luzonenſibus* Camelli Mſ & delineat. *an* Mottenga *Malab.* Muſta *Bram.* H. Mal. v. 12. Tab. 52. p. 97.

The *Heads* are ſmall, round, and ſeldom more than 3, the middlemoſt is biggeſt, the reſt ſet round it; theſe often when ripe rub off, and the ſtalk in the middle only remaining (to which the Seed ſtuck) it very much reſembles a Mouſe-tail: The *Leaves* about the Head are generally 3, and ſometimes 4, but are much broader, ſhorter and ſtiffer than No 253. It *Flouriſhes* in *September.* Dr *Sloan*, who hath found this ſame *Cyperus* in *Jamaica*, obſerves the *Roots* to be fragrant, tho thready as the *Hort. Malab.* alſo does of the *Mottenga.* I have ſamples of this near 2 Spans *long.*

S. B. 7. 274.

274. Neer Naunel pu *Malab.*

Gramen pratenſe *Madraſpat.* panicula longiſſima.

The *Glume* or *Husk* of this Graſs is mighty ſmall, the *Spike* or *Panicle* long, but not much ſpread.

S. B. 7. 275.
Pluk. Tab. 300. *Fig.* 8.
Alm. Bot. 175. *pl.* 2.

275. Code mutta ge pille *Malab.*

Dactylon *Madraſpatan.* erectum fere tetraſticon.

Gr.-Iſchemen *Malabar.* ſpecioſius longioribus & mucronatis foliis *Pluk.* Tab. 300. Fig. 8. it may alſo be the ſame which Dr *Plukenet* calls *Gram.* Dactylon *Orientale* ſtellatum ſpica elegantiori e *Madraſpatan.* Alm. Bot. 175. pl. 2.

S. B. 7. 275. 2.

This grows *upright* from a fibroſe *Root*, hath very long *Leaves*, and generally but 4 ſpikes together, which diſtinguiſhes it from another I have received from thence, *viz.* Dactylon *Madraſpatanum* procumbens ſpicis fere quinquifidis *Of all the* Graſſes *yet* Figured the Gramen *Stellatum* Ægyptium *Veſlingij* p. 53. ſeems the neareſt to reſemble this laſt Graſs, becauſe ſome of theſe *Spikes* are ſhorter than others, and that it *Roots* at ſeveral joynts, which *Veſlingius* complains his *Figure* does not expreſs; it riſes about a foot high, which alſo agrees with the deſcription.

S. B. 7. 276.
Muſ. Petiv. 446.
Muſ. Petiv. 447.

276. Coondu manne poondoo *Malab.*

Here are 2 *Varieties* of this *Plant*, viz. Perexil *Champaccenſis* humilis polycephalus albus capillaceo folio *Muſ. Petiver* 446. & Perexil *Champaccenſis* capitulis carneis capillaceo folio *Muſ. Petiver* 447. Beſides its colour, this laſt grows longer than the other.

S. B. 7. 277.
Pluk. *Tab.* 190. *Fig.* 4.
H. Ox. *ſ.* 8. *p.* 204. 56.

277. Nelle matche pille *Malab.*

Gramen *Madraſpat.* pratenſis facie, glumis minimis. *an* Gram. *Madraſpat.* panicula ſpicata longa ſpecioſiſſima *Pluk.* Tab. 190. Fig. 4. *H. Ox.* ſ. 8. p. 204. 56. ?

S. B. 7. 278.
Muſ. Petiver 579.

278. Caudere pille pu *Malab.*

Amourettes *Madraſpatan.* ſpica ſimplici Loliacea *Muſ. Petiver* 579.

This elegant Graſs is not ramoſe, but bears its ſingle *Panicles* (which very much in ſhape and magnitude reſemble the *Common Love Graſs*, viz. S. B. 7. 294.) in one ſpike alternately, and ſometimes inclining to one ſide without footſtalks.

S. B. 7. 294.
S. B. 7. 279.
Muſ. Petiver 64.

279. Wootare pille pu *Malab.*

Gramen Dactylon *Madraſpatan.* ſpicis ariſtatis ſingulis, binis, terniſve *Muſ. Petiver.* 64.

This grows ſometimes 2 foot high, its ſpikes uncertain, commonly 2 or 3, and ſometimes ſingle.

280. Cu

280. Cauducu pille *Malab.*

Milium grano acuto baſi geniculato.

It grows in *Spikes*, the *Grains* pointed, and each ſtands as it were in a blackiſh ring or ſocket.

281. Pange pille *Malab.* S. B. 7. 280.

Amourettes *Madraſpat.* panicula ſparſa, locuſtis parvis. *an* Gramen *Amoris* Indiæ *Orientalis* panicula ſparſa, glumarum petiolis huc illuc undatim reflexis *Pluk.* Tab. 190 Fig. 3. *H. Ox.* ſ. 8. p 204. 55. ?

Pluk. *Tab.* 190. *Fig.* 3. *H.* Ox. *ſ.* 8, *p.* 204. 55.

This comes next to S. B. 7. 293. where you will ſee how it differs.

282. Mier Coree *Malab.* S. B. 7. 282.

Juncus *Madraſpat.* minimus ſtellatus.

This proceeds from a brown threddy *Root*, from whence grow thick tufts of Graſs, rarely exceeding 3 inches; its heads are many, ſmall, ſquamoſe and conical, each guarded with a Beard or two, the longeſt of which almoſt equals in length the Ruſh or top one.

283. Ponne pille *Malab.* S. B. 7. 283.

Ægylops Madraſpat. glumis piloſis ariſtatis.

Gramen Secalinum *Indicum* ſpica gracili tomentoſa ariſtis longioribus ad ſe invicem intortis. *Pluk.* Tab. 191. Fig. 4. *H. Ox.* ſ. 8 p. 190. 9. *Tab.* 4. Ser. 3. *Fig.* ult. Theſe beards reſemble the Seed of *Geranium* or *Cranes Bill.*

284. Mauddetauru pille *Malab.* S. B 7. 284.

Panicum *Madraſpat.* ſpica longiſſima non ariſtata.

Milium *Madraſpat.* ſpica ſimplici pretenue. *Muſ. Petiver* 563. Muſ. Petiv. 563.

The *Spike* of this reſembles that of *common Plantain*, but is much longer, *viz.* ſome a foot or more.

285. Tundange pille *Malab.* S. B. 7. 285.

Gramen *Madraſpat.* e ſingulis geniculis ramoſum. *This may be of the* Millet kind, *but being an imperfect Specimen, I dare not affirm it.*

286. Pea pille *Malab.* S. B. 7. 286.

Panicum *Madraſpat.* latifol. ſpica aſperi facie latiore.

This reſembles our *Rough Panick Graſs*, which is ſometimes found wild with us (but oftner in *Gardens*) but its *Leaves* are broader, as is its *Spike* and more looſe, but leſs rough.

287. Souta Cora *Malab.* S. B. 7. 287.

Juncus *Malabar.* major, ſuper capitulum tantum geniculatus, *Nobis.* Juncus conglomeratus *Madraſpatenſis* acumine geniculato Pluk. *Tab.* 197. *Fig.* 6.

H. Ox. ſ. 8. p. 231. 1 & 9. H. Mal. v. 12. Tab. 71. p. 135.

Pluk. Tab. 197. Fig. 6. *H. Ox.* Sect. 8. p. 231. 9. Juncus *Indicus* major ſtylis geniculatis *H. Ox.* ſ. 8. p. 231. 3. Tijelli *Mal.* Tama pocala *Bram.* H. M. *Vol.* 12. Tab. 71. p. 135.

What is moſt remarkable in this Bull ruſh *is, its being* joynted *above the* head *only and not below.*

S. B. 7. 288. Muſ. Petiv. 599.

288. Coop pu Corae *Malab.*

Juncus *Madraſp.* fere tricephalos, ſquamis tortilibus dentatis *Muſ. Petiver* 599. This is a very elegant Ruſh, and its peculiarity is rarely to exceed 3 heads on one Ruſh, the *Scales* of which are *twiſted*, and as it were *ſerrated.* Its commonly about a foot *high.*

S. B. 7. 289. Muſ. Petiv. 570. H. Ox. ſ 8. p. 185. pl. 10. Cat. Pl. Jam. 33. pl. 8. H. Mal. V. 12. Tab. 44. p. 81.

289. Ponne varaga pille *Malab.*

Seſamum granuloſum bicorne minus *Madraſpatanum.* Muſ. *Petiver* 570. *an* Gramen *Dactylon* repens *Indicum* ſpica gemella *H. Oxon.* ſ. 8. p. 185. 10. *an* Gr. *Dactylon* bicorne repens, folijs latis brevibus *Cat. Pl. Jam.* p. 33. 8. *an* Tereta pullu *Hort. Mal.* v. 12. Tab. 44. p. 81. ?

S. B. 7. 290. Muſ. Petiv. 591. H. Ox. ſ. 8. p. 236. pl. 5. S. B. 7. 294.

290. Tear Corae *Malab.*

Cyperus *Madraſpat.* maximus, panicula criſtata contractiore. *Muſ. Petiver* 591. Cyperus *Orientalis* major, paniculis turgidioribus denſius ſtipatis *H. Ox.* ſ. 8. p. 236. 5. Each ſingle *Spike* reſembles that of the *Love-graſs*, No 294. following. Theſe are thick ſet in oblong heads, which ſometime ſpawn or divide at the bottom, they are commonly an inch long, and ſometimes more, ſtanding on footſtalks of an unequal length, from ½ an inch or ſcarce any to 5 or 6.

S. B. 7. 291.

291. Corki pillu *Malab.*

Donax *Madraſpat.* vulgaris facie. *an* Arundo *Indica* farcta major *H. Ox.* ſ. 8. p. 220. 14. ? *an.* Nain Canna ſ. *Canna* ſylveſtris *Malab.* Piſcobo *Bram.* H. Mal. *Vol.* 12. Tab. 73. p. 139.

S. B. 7. 292. Lugd. 421. Fig. 2. C B. 3. pl. 3. C B. Theatr. 113. Fig. 3. H. Ox. ſ. 8. p. 184. Tab. 3. Fig. 4. Ser. 2. Pluk. Tab. 189. Fig. 3.

292. Colirarru pillu *Malab.*

Dactylon *Arundinaceum* minus. *Gramen* vulgare *Dalech. Lugd.* 421. Fig. 2. *whoſe* Figure *it very well reſembles.* Gramen *Dactylon* folio Arundinaceo minus *C B.* 8. pl. 3. *Theatr.* 113. Fig. 3. *H. Ox.* ſ. 8. p. 184. Tab. 3. Fig. 4. Ser. 2. I take Dr *Plukenets* Gramen geniculatum folijs brevibus aculeos mentientibus *Madraſpatanum*, Tab. 189. Fig. 3. to be nothing elſe than the creeping part of this Graſs, having ſamples very like it, and this part is often ſent without its ſpikes, as may be ſeen in the firſt Leaf of this *Collection:* This differs little from the *Gramen legitimum* Cluſ. *Hiſt.* l. 6. p. 217. Fig. and its ſmallneſs may proceed as the *Botan. Monſpel* p. 112. ſays from its growing in dryer places.

293. Mul-

293. Mulgaude pillu *Malab.* S. B. 7. 293.

Amourettes *Madraſpat.* panicula minus ſparſa, locuſtis perexigi is. *This ſeems to grow Pyramidal, and not ſo expanded as* No 281. *the* glumæ *are alſo* leſs *and* ſhorter.

294. Puli pillee *Malab.* S. B. 7. 294.

Amourettes vulgaris.

Eragroſtis ſ. *Gramen* elegantiſſimis paniculis *CB.* Phyt. p. 9. pl. 36. Gramen *Amoris* dictum *I B.* Vol. 2. l. 18. p. 470. c. 98. ἐραγρωςις Gr. *Amourettes* Cluſ. *Hiſt.* l. 6. 218. Fig. 1. *Cluſ.* Hiſp. 500. Fig. *I B.* prodr. 51. pl. 30. Gr. *Filiceum* ſ. polyanthos *Lugd.* 428. Fig. 3. Gr. paniculis elegantiſſimis, ſive majus *CB.* 2. 5. *Theatr.* 25. Fig. 5. Gr. panniculoſum *Lob. Obſ.* 11. Fig. 1. Gr. Panniculatum *Ger.* 8. Fig. pannic. elegans *Ger. em.* pann. ſativum *Heragroſtis* Tab. Icon. 204. Gr. pratenſe VI *Dod.* Pempt. 561. Fig. 4. Phalaris prat. major ſ. Gr. *Tremulum* maximum *Park.* 1156. Fig. 1. *Cluſ.* Hiſp. p. 500. Fig. *H. Oxon.* ſect. 8. p. 204. Tab. 6. ſer. 2 Fig. 52. H. Pl. *Paris* 457. 5. *Ray* H. Pl. 1274. 5.

C B. *Phyt*, 9. *pl.* 36. I B. *V.* 2. 470. *cap.* 98. *Cluſ.* Hiſt. 500. *Lugd.* 428. Fig. 3. C B. 2. 5. Theat, 25. Fig. 5. *Ger.* 8. Fig. *Dod.* p. 561. Fig. 4. *Park.* 1156. Fig. 1

This elegant Graſs is frequent about *Paris* and *Montpelier*: I have alſo had it from *Surat* in the *Eaſt Indies*, and *Virginia* in the *Weſt*.

295. Cavaree Codee *Malab.* S. B. 7. 295.

Dactylon *Malabar.* maximum eſculentum.

Gramen Dactylon *Orientale* majus Frumentaceum, ſemine *Napi* Pluk. *Tab.* 91. Fig. 5. H. *Ox.* ſ. 8. p. 185. 13. & *Gramen* Dactylon *Indicum*, ſeminibus rotundis *H. Ox.* ſ. 8. p. 186. 20. Tsjetti pullu *Malab.* Nazano *Brach.* H. Mal. V. 12. Tab. 78. p. 149. Coracan *Knox* Hiſt. *Ceyl.* p. xi. The breadth and largeneſs of the *Spikes* diſtinguiſhes it from the reſt of this kind.

Pluk. *Tab.* 91. *Fig.* 5. *H.* Ox. *ſ.* 8. *p* 185. 13. & *p.* 186. 20. H. Mal. v. 12. *Tab.* 78. p. 149.

296. Mile Corea *Malab.* S. B. 7. 296.

Cyperus Borneocus *Limonij* panicula.

This has ſeveral *Panicles* much expanded. each *Spike* is very ſlender and alternately ſet, as are its minute ſquamæ, which reſemble (tho much leſs) the *Limonium* or *Sea Lavander*, before its Flowers come forth.

My worthy Friend, Mr *Sylvanus Landon*, firſt brought me this Plant from *Borneo*.

S. B. 7. 297. 297. Shegapu Corea *Malab.*

Juncus *Madraſpat.* capitatus minor.

Its *Root* long and fibrous, *Leaves* ſmall and narrow, *Heads* ſomewhat like *Trefoil*, bearded with 2 or 3 ſhort Leaves, This grows about 4 inches *high*.

S. B. 7. 298. 298. Maſh Corae *Malab.*

Muſ. Petiver 592. Cyperus Filicinus medius panicula ſparſa e *Madraſpatan, Muſ.* Petiver 592.

The main difference between this and No 265. is its panicle, which is here ramoſe or proliferoſe; this is alſo generally a lower Graſs.

S. B. 7. 299. 299. Cumboo pillee *Malab.*

Gramen Dactylon *Madraſpatanum* Graminis *Mannæ* facie. an *Gram.* Dactylon eſculentum, *CB.* 8. 8.

That accurate Botaniſt *John Bauhine*, I obſerve takes this laſt, and the *Gramen Dactylon folio latiore C B.* 8. pl. 4. to be the ſame, and only differ in *Culture*, which I am inclined to believe, the laſt being *Spontaneous* about *Gardens*, the other *Cultivated* in *Germany*: *Authors* I find give 2 differing *Figures* of the *Gramen Mannæ* ſeu *Dactylon* Eſculentum, *viz.* one with long ſmooth Leaves, and few or no joynts; the other with ſhorter Leaves, more joynts and hairy vagini or ſheaths, the firſt of which I take this to be a variety, if not the ſame.

S. B. 7. 300. 300. Arna Corea *Malab.*

Pluk. Tab. 119. *Fig.* 3. H. Ox. ſ. 8. p. 238. pl. 30. *Juncus* coniferus *Madraſpat.* minor capitulis oblongis. *Gramen* Cyperoides *Madraſpat.* Juncelli Geſneri capitulis ſparſis *Pluk.* Tab. 119. Fig. 3. *Cyperus* minor *Madraſpat.* Juncelli *Geſneri* capitulis *H. Ox.* ſ. 8. p. 238. pl. 30. *an.* Gram. *Luzon.* 2. Camel Mß cum delineatione.

This and No 271. are nicely different, if not the ſame, this ſeems to have longer heads, the other rounder.

S. B. 7. 301. 301. Coode pille poo *Malab.*

Milium *Madraſpat.* glabrum, paniculis ac granis rarioribus. *Grows* from one to 3 Spans *high*, its *Spikes* rarely branched, the *Seed* one juſt above the other, and generally on one ſide the Spike.

S. B. 7. 302. 302. Cuctremile pillu *Malab.*

S. B. 7. 272. Amorettes *Madraſpat.* criſtata majus, ſpica longiore viſcoſa. This differs from No 272. in being taller and its ſpikes much longer and larger.

303. Colletta pille *Malab.*

S. B. 7. 303.

Phænix Madraſpat. ſpicis plurimis e ſingulis geniculis. *Gramen* Loliaceum majus ſpicis in verticillas multiplicatis Pluk Tab. 191. Fig. 6. Alm. Bot. 173. pl. 16. H. Ox. ſ. 8. p. 182. 5.

Pluk. Tab. 191. Fig. 6. H. Ox. ſ. 8. p. 182. 5.

This is a tall reedy Graſs, but ſtalk pithy, its ramoſe, and from every joynt comes ſeveral long Spikes, exactly reſembling thoſe of *our Dwarf ſea Darnel Graſs*, in Mr *Rays* Synops. p. 182. 3. ed. 2. p. 250.

Ray Syn. 182. pl. 3.——ed. 2. 250.

304. Vauda maule code *Malab.*

S. B. 7. 304.

Juncus *Madraſpat.* capitatus major.

This is larger then No 297. otherwiſe very like it.

305. Velli pille *Malab.*

S. B. 7. 305.

Dactylon *Arundinaceum* vulgatiſſimum majus.

Gramen *Cluſ.* Hiſ. 497. fig. *Ang.* *Cæſalp*-

Gram. legitimum *Cluſ.* Hiſt. l. 6. p. 217. Fig.

Gr. *Canarium* alterum Iſchemi paniculis, maximo Gramini marino Arundinaceo congener *Lob.* Obſ. 12. Fig. 1. *Gr.* Canarium *Iſchæmi* paniculis *Park.* 1179. Fig. 5. Gr. *Dactylon* ſecundum folio *Arundinaceo* C B. *Phyt.* 19. pl. 88. Gr. *Dactyl.* fol. Arundinaceo majus (aculeatum *forte* Plinij *C B.* 7. 2.) *C B.* Theatr. 112. Fig. opt.

Cluſ. *Hiſp.* 497. Fig. *Hiſt.* *l.* 6. p. 217. Fig. Lob. *Obſ.* 12. Fig. 1. *Park.* 1179. Fig. 5. C B. *Phyt.* 19 *pl.* 88.

Cluſius has given a very good Figure of this which *Parkinſon* and *Lobel* have copied, *Caſp. Bauhine*, pag. 7. makes this his 2d *Dactylon* & p. 8. ſuppoſes it alſo his 3d, which differs only in being ſmaller, as I have hinted before under No 292. The greater I have received from the Coaſts of *Spain* and *Portugal*, and the leſs from the *Iſlands* of *Chio* and *Coos.*

Lobel in his *Obſervations* p. 12. takes notice, that on the Coaſts of *Narbone*, its *Roots* are ſo like the *common Reed*, that you would ſay they were the ſame, the like I have obſerved of its ſtalks, *Caſp. Bauhine* might therefore more properly have termed this Graſs rather *Radice* (then *folio*) Arundinaceo.

N. B.

306. Neer chouta corae *Malab.*

S. B. 7. 306.

Juncus aq. minor *Madraſpat.* ſuper capitulum geniculatus. This ſeems to differ from *Souta cora* No 287. in being much leſs, not exceeding a foot. The *Malabar* word *Neer* being added to this, denotes it to grow in watry places. *See* S. B. *Vol.* 2. pl. 91

307. Narre coock pille *Malab.*

S. B. 7. 307

Gramen Filiceum *Madraſpat.* ſpica tenuiore.

This is next of kin to *S. B.* 5. 218. but its *Leaves* are Graſſy and leſs (the others are large and rough on the Edges like a *Cyperus*)

rus) the Spikes of this much ſlenderer, and with fewer and ſmaller diviſions.

S. B. 7. 308. 308, Ca verae pille *Malab.*

Muſ. Petiv. 573. *Dactylon* Madraſpat. *Gr. Mannæ* facie, ſeminibus Cilijinſtar piloſis Muſ. Petiver 573.

This differs from *S. B.* 7. 299. in having its *Spikes* or *Fingers* ſhorter, and rarely more then 4 or 5, whereas No 299, has them much longer (as alſo its Leaves) and commonly 5 at leaſt, but what diſtinguiſhes this moſt particularly, is its hairy fring'd Seed, which is very remarkable, ſtanding out like thoſe on our Eye-lids, but much ſhorter.

I take this *Ma'abar* word *pille* to ſignify *Graſs*, and that it may be a corruption of *Pullu*, which in the latter end of the 12th Volume of the Hort Malab. is added to above a dozen Plants, and they all of this kind.

S. B. 7. 309. 309. Torapo *Malab.*

Bromos *Madraſpat.* ſpicis prælongis, minus ſparſis.

This reſembles Mr *Bobarts Haver Graſs* or *Feſtuca* Avenacea ſterilis ſpicis erectis *Ray* Synopſ. 237. & ed. 2. p. 261. 3. *Pluk.* Tab. 299. Fig. 2. but that theſe Spikes are much longer and ſlenderer. Pluk. *Tab.* 299. *Fig.* 2.

S. B. 7. 310. 310. Neer paſh *Malab.*

This may be a ſort of *Potamogiton* or *Pond weed* (*Neer* ſignifying *Water*, as I have before hinted, *viz.* No 91. & No. 306.) but it being an imperfect ſpecimen, I dare not be poſitive.

S. B. 7. 311. 311. Peele Chellende naicum *Malab.*

Milium *Madraſpat.* glabrum, panicula ramoſiſſima grano minore.

This ſeems that ſort, which when diveſted of its grain, is ſent into *Europe* in Bruſhes for Cloaths.

S. B. 7. 312. 312. Parpaticum *Malab.*

Spergula *Roſea* multicaulis polyanthos e *Madraſpatan*, S.B. 5. 220. *ſeu* Act *Phil.* No 276. p. 1020.

313. Nelle monnee *Malab.*

Ger. 82. c 59. Arundo *Lithoſparmos* Ger. emac.
Park 430. c. 7. *Lachryma* vulgo *Cæſalp.*
Chabr. 180. Lachryma Job. *Ger.* 82. c. 59. Fig. *Park.* 430. c. 7 Fig.
Fig. 1. 2. Lachryma Jobi I B. *prodr.* 50. pl. 34. *Cluſ.* Hiſp. 501. Fig. *id.* Hiſt
I B. v. 2. l. 18. p. 449. c. 46. l. 6. p. 216. Fig. *Dod.* Pempt. 506. c. 24. Fig. *id* Trag. *Hiſt.* 71. Fig
H *Mal.* V. 12. H. *Ox.* ſ. 8. p. 249. c. 29. Tab. 13. ſer. 2.
Tab. 70. p. 133. Lachrima *Jobi* vel *Mariæ* Chabr. 180. Fig. 1. 2. L. J. multis five
Ray *H. Pl.* 1252. c. 11. Milium Arundinaceum *I. B.* v. 2 l. 18. p. 449. c. 46. Fig.

Lachryma *Jodocy* alijs *Jobi* Geſn. H. *Germ.* app. 293.
Lagrime di *Giobbe* Durant 240. Fig.

Lithoſpermum Arundinaceum *Dalech.* Lugd. 1178. Fig. L. Arundan Dioſc. & Plinij C. B. 258. 1. Phyt. 499. 5. Lithoſp. majus *Trag.* 916. c. 140. *Lith.* Plinianum, *ſive* majus, Lachryma Job. ſ. Chriſti *Ad.* 16. Fig.

Milium Arundinaceum, ſemine Lithoſpermi facie maximo duriſſimo *Hort.* Lugd.

Catri conda *Malab.* Len Camani *Bram.* Hort Malab. *Vol.* 12. Tab. 70. p. 133. *Ray* H. Pl. 1252. c. 11. *an* Coix *Theophraſt.* l. 1. c. 16.

Lagrima de Moyſen *Hiſp*, Larmes de notre Dame *Narbon.* Marien trachen *Germ.* Jobs teares *Angl.*

Its ſaid to grow wild in the *Iſlands* of *Rhodes* and *Candy*, I have received it ſeveral times from the *Eaſt Indies*, but with us its only nurſt in *Gardens*.

314. Tenne *Malab.*

S. B. 7. 314.

Panicum *Malab.* eſculentum, ſpica ariſtata e plurimis capitulis denſe ſtipata.

Panicum *Indicum* majus, ſeminibus albicantibus *H. Ox.* ſ. 8. p. 188. 3.

Tenna *Malab.* Varai *Bram.* H Mal. V. 12. Tab. 79. p. 151.

H Ox. ſ. 8. p 188. 3.
H. Mal. v. 12. Tab: 79 p. 151

The *Spike* of this is ½ a foot long, compoſed of ſeveral ſmaller Spikes or oblong Heads, ſet ſo cloſe, that the whole Spike hardly ſeems divided, eſpecially whilſt young; theſe are full of ſmall *ariſtæ*, each *Seed* is ſmall and whitiſh, and has a large ſulca or furrow on one ſide as in *Wheat* and *Barley*. With this Seed Mr *Brown* ſays they feed their *Birds* and the *Hort. Malab.* alſo affirms they are edible.

315. Ravana Meſe *Malab.*

S. B. 7. 315.
H. Mal. v. 12. p 143. Tab 75.
H O. ſ 8. p. 217. 6,

Spartum *Avenaceum* pumile *Malabaricum.*

Gramen Sparteum *Madraſpat.* majus craſſioribus & brevioribus folijs *H. Ox.* ſ. 8. p. 217. 6. Ily mullu Hort Malab. V. 12. p. 143. Tab. 75. where its Figure very well reſembles this Specimen which grows about a Span high.

316. Tagata Corae *Malab.*

S. B. 7. 316.
H. Ox. ſ. 8. p. 238. pl. 36.
Pluk. Tab. 300. Fig. 7.
Alm. Bot. 175. pl. 5.

Juncus ſtellatus Madraſpatanus capitulis conoidibus ſquamoſis. Cyperus *Madraſpat.* capite ex ſpicis plurimis in cacumine caulis glomerato H. Ox. l. 8 p. 238. pl 36. *Gramen* Cyperoides *Madraſpatanum* capite ex ſpicis plurimis acuminatis in cacumine caulis glomerato *Pluk.* Tab. 300. Fig. 7. Alm. Bot. 178 pl. 5.

To

To theſe we add the following Shells, *which the Reverend* Dr George Lewis *ſent me very lately from* Fort St George.

S. B. 7. 1. Liſt. H. C. L. 3. Tab. 179.

1. *Pecten* MADRASPATANUS *inæqualis albus, nebulis aſperſis.* *an* Pecten *variegatus,* ſtrijs circiter 18 majuſculis donatus. *Liſt.* Hiſt. *Conchyl.* Lib. 3. Tab. 179. Fig. 16. This is a white *Schallop* with brown *Cheſnut* Clouds, is pretty round, being as broad as long, *viz.* 1 ½ inch, its *Ears* ¾ broad unequal, *viz.* one bigger then the other, its compoſed of about 18 *Striæ* as Dr *Liſters* is.

S. B. 7. 2. Liſt. H. C. L. 3. Tab. 232.

2 *Mytulus ſtriatus* MADRASPAT. *anguſtus.*

This *Shell* is ſometimes near 2 inches long, the hing of which is 1 and ¼, its oblong, but rounder at the noſe end, and more pointed at the other, it ſeems to be that which Dr *Liſter* has figured without any Name, in his 3d *Book* Tab. 232. at No 66, weighs ſomething leſs then a Dram.

Under the denomination of *Mytulus* I rank ſuch Shells as have a long hing with many ſmall furrows, and are ſomewhat Oval. Theſe Dr *Liſter* in his *Hiſt. Conchyl.* Lib. 3. *Sect.* 2. cap. 1. *Figures* under the Title of *Pectunculi polyleptoginglymi margine ex altera parte productiore.*

S. B. 7. 3.

3. *Mytulus ſtriatus* MADRASPAT. *latus.*

A Shell of 1 inch and ¾ *long*, 1 ¾ *broad* from the hing, which is 1 long, its very like the laſt but much wider, it *weighs* better then a Dram.

S. B. 7. 4. Liſt. H. C. L. 3. Tab. 310. Fig. 146.

4. *Pectunculus* Madraſpatan. *variegatus craſſus, ſtrijs lateralibus.* an *Pectunculus* ex rufo variegatus, ſtrijs tenuibus *Liſt.* *H. C. l.* 3. *Tab.* 310. *Fig.* 146.

This is thick and round, its an inch and ¾ from the Hing to its oppoſite ſide, and 2 inches from end to end, its marbled with brown, the peculiarity of this Shell, is its ſtriæ in the middle from the back to each ſide. This *weighed* ℥ß & ℈ij, but they differ according to their bigneſs.

S. B. 7. 5. Liſt. H. C. l. 3. Tab. 320. Fig. 146.

5. *Pectunculus* Madraſpatan. *craſſus, vulgaris facie, maculis croceis.* an *Pectunculus maculatus majoribus ſtrijs conſpicuus* Liſt. *H.* C. l. 3. Tab. 320. Fig. 146. This has the face and magnitude of our *Common ſmall edible Cockle*, but much ſtronger, thicker and ſpotted with yellow. Some of theſe weigh above ʒi.

III. *A Letter from Dr* Thomas Molyneux, *F. R. S. to the Right Reverend* St George, *Lord Biſhop of* Clogher *in* Ireland, *containing ſome Thoughts concerning the Ancient* Greek *and* Roman Lyre, *and an Explanation of an obſcure Paſſage in one of* Horace's *Odes.*

My very much Honour'd Lord.

OUt of the abundance of your good Nature, and the undeſerved kindneſs you have always ſhewed me, your Lordſhip has formerly been pleaſed, not to diſlike ſome Thoughts I have communicated to you on ſeveral Subjects, as they occaſionally came in my way; this has given me incouragement to trouble you again in the like manner, and ſend you the following Remarks, which I accidentally made, as I was reading over one of *Horace's Odes* to my little Cozen *Samuel Molyneux*; whom I find, I thank God, a Child of very pregnant Parts, and likely to follow the ſteps of his late Father, your good Friend.

Perhaps you may think what I am going to write the more conſiderable, and the better deſerving your Lordſhips notice, becauſe it explains, and as I imagine, retrieves an ingenious Thought, that for ought that appears, had been wholy loſt in a piece of Poetry, which the Learnedſt Criticks both of the paſt and preſent Age, have eſteemed one of the moſt correct Maſter pieces Antiquity has left us in its kind, I mean the 3d Ode of the 4th Book, beginning with theſe Words,

Quem Tu Melpomene, &c.

This with an other of *Horace*'s *Odes*, the famous *Julius Cæſar Scaliger* in his Treatiſe *de Re Poetica lib.* 6. makes choice of to recommend above all the reſt, and gives it a moſt extravagant *Encomium*; declaring he would rather be the true Author of this little Poem, than abſolute King of *Arragon*, ſo high an opinion he had of its matchleſs Excellency.

And the celebrated Monſieur *D'Acier* in his Commentary upon this *Ode*, ſays, he believes one cannot find either among the *Greek* or the *Latin* Poets, any thing more correct and elaborate than this, ſo delicate and natural, ſays he, are its Thoughts, and the turn of its Expreſſions carry with them ſuch a noble loftineſs and vivacity.

However, after all theſe extraordinary recommendations the Criticks have been pleaſed to beſtow upon this performance, of certainly the beſt tho the firſt of the *Roman Lyrick* Poets; yet one of the moſt beautiful paſſages, and ſurprizing fancies of the *Ode*, ſeems to me, and I ſhould be glad to know your Lordſhips opinion in the point, to have been ſo overlookt by them, that neither they nor any of the Commentators, I have hitherto had an opportunity to conſult, and I have examined the moſt chief of them, as *Lambin*, *Menelius*, *Bond*, *Deſpres*, *Meur Dacier*, &c. have fully comprehended the meaning of the Poet, or the whole ſcope of his ſence, which he expreſſes in theſe Words,

O Teſtudinis aureæ
Dulcem quæ ſtrepitum, Pieri, temperas!
Omutis quoque Piſcibus
Donatura Cygni ſi libeat ſonum!

I muſt freely own, my Lord, when firſt I reflected on theſe Lines, and obſerved *Horace*'s great Heat and Vehemency in his repeated exclamation, upon admiring his *Muſe*'s power, becauſe ſhe could give when ſhe pleaſed even to *Mute Fiſhes*, the melodious Voice of the Swan, I was not a little ſhockt and confounded, for I lookt upon the fancy as perfectly forced and groundleſs; founded upon nothing that was real or true Nature; and therefore could paſs for no more, than a wild rant or extravagant Whim of the Poets, ſignifying little if any thing at all; and brought freſh into my Mind, the Character he himſelf gives in another place of ill Verſes.

Verſus Inopes Rerum Nugæq; canoræ.

For I could not conceive in any ſence whatever, how he could ſuppoſe his *Muſe* to be able to give to a *Dumb Fiſh* this ſweet melodious Voice.

None of his Commentators gave me the leaſt ſatisfaction towards the clearing of this paſſage, or the ſolution of this difficulty; I found they were all ſilent as to the main Point, and yet I could not with quietneſs of Mind, raiſe even but in my own Thoughts, ſo railing and high an Accuſation as this was againſt the Prince of the Lyrick Poets: nor could I conceive ſo great a Judge and Maſter in the art of Poetry, ſo particularly remarkt for his Propriety of thought, and delicacy of expreſſion, in ſo labour'd and exquiſite a Poem as this, conld poſſibly have been guilty of ſo weak a failure, or rather have run into ſo groſs a fault.

This made me ſoon alter my Opinion, by giving quite another turn to my Judgment, and immediately conclude the fault muſt not be in the excellent Author, but rather in my dull and imperfect apprehenſion of his true ſence; and that there muſt be certainly couched in theſe words, ſome further meaning than what occur'd to every one at the firſt tranſient Reading, or from the bare conſtruction of the Words according to the common *Syntax*.

So I put myſelf to conſider a little, whether upon ſecond thoughts, I could not diſcover what might be the true intention or full purport of the Poet in theſe lines, and after peruſing them a while, what was before dark and obſcure, appeared ſo plain and evident, that I was immediately convinced in myſelf, he could not poſſibly have any other mea- than this.

After he had in the Verſes going before, acknowledged how much he was owing to the bounty of his Muſe, here he makes a ſudden exclamation to extol her great Art and Myſtery, who by mixing various Notes, could compoſe ſuch ſweet Harmony upon the *Guilded Lyre* or *Teſtudo*, and by her ſurprizing Power could when ſhe pleaſed, give even to mute Fiſhes, or the hollow Shells of the *Teſtudines Aquaticæ* or *Water Tortoiſes*, a ſort of Fiſh, of which I imagined they made their Lyres in old Times, the ſweet melody of the Swan.

As for the compariſon he makes to the voice of a dying Swan; tho this were granted an error, yet I thought it ſuch a one, as might paſs very well, ſince it ſerves here only as an alluſion, and might be uſed for that end, becauſe it was certainly a received vulgar opinion in *Horace*'s days, as it prevails ſtill in ours;and therefore might properly enough,tho a Fiction, illuſtrate this mighty attribute he in ſuch poſitive Terms, and in ſo ſurprizing a manner aſcribes here to his *Muſe*: for even a *Vulgar Error* univerſally imbraced, was ever Authority ſufficient for either a Poet or an Orator to draw from it a compariſon or a ſimile.

Monſieur Dacier I confeſs,to whom we are obliged for the fulleſt, moſt learned and judicious comment extant upon this Author, has nothing that in the leaſt favours the foregoing explanation; but on the contrary in his Gloſs upon theſe Words in the ſame Ode,

Totum Muneris hoc tui eſt, &c.

Says, *Horace* could not have given a more ample Teſtimony of his Modeſty, than he has ſhewn in this Expreſſion which aſcribes all the merit he had wholly to the gift of his Muſe, who might, ſays he, if ſhe ſo pleaſed, have made even a mute Fiſh ſpeak; which intimates, 'twas a thing he imagin'd ſhe had never done; tho according to my ſentiments, the Harmony of every ſpeaking Lyre, was then no leſs than the voice of a dumb Fiſh, raiſed by the power of the Muſe in the Allegorick manner of ſpeaking they affected in thoſe days, which now we ſhould ſay was done by the skill of the Muſician.

Tho this expoſition is ſo very eaſy and natural, that it ſeems to me at the firſt propoſal to carry along with it its own evidence, yet being my ſence alone, and backt with no other Authority, I could not throughly acquieſce in it, or be ſatisfied I had truly lit upon the ſame Ideas that were in *Horace*'s thoughts when he wrote thoſe words, unleſs I plainly found, that the *Teſtudo* or *Lyre* of the Ancients, was made of the back or hollow ſhell of the *Tortoiſe*, as the name ſeem'd fully to import.

This put me upon the ſearch, whether I might not find paſſages in ſome of the older Authors, that ſpeak of this as matter of Fact; which, if I diſcover'd I thought it would evince the true meaning of theſe Lines of *Horace* beyond all contradiction.

And upon inquiry, it appears from ſeveral Hands, 'twas a current piece of Hiſtory generally received among the Ancients, that *Mercury* was the firſt inventor of the *Lyre* (whence *Horace* in his 10th Ode of the 1ſt Book ſtiles him *Curvæ Lyræ Parentem*) and that he made it of the ſhell of a dead *Tortoiſe*, he accidentally found on the Banks of the River *Nile*. I might produce ſeveral Teſtimonies to this Point, but I think two will be ſufficient, and ſhall trouble your Lordſhip with no more.

The firſt I ſhall take from an old Phyſician, a *Greek* Poet, that writ above a hundred years before *Horace*, I mean *Nicander* in his Poem he calls *Alexipharmaca*, where ſpeaking of the Antidotes proper againſt the Poiſon of the *Salamander*,

mander, he recommends both the *Sea* and the *Mountain Tortoiſe* in theſe Words,

Ἀμμίγδην ἁλίοιο καθεψηθέντα χελώνης
Τυίοις, ἣ ταχινῇσι διαπλώει πτερύγεσσιν
Ἄλλοτε δ᾽ οὐρείης κυτισηνόμου ἣν τ᾽ ἀκάκητα
Αὐδήεσσαν ἔθηκεν ἀναύδητον πὲρ ἐοῦσαν
Ερμειης, ζαρκὸς γαρ ἀπονόσφισε χέλειον
Αἰόλον, ἀγκῶνας δὲ δύω παρετείνατο πέζαις.

Which I find ſo well turned into Verſe and ſo cloſely tranſlated by *Johannes Gorreus* a *Pariſian* Profeſſor of Medicine of the laſt Age, that I cannot omit giving your Lordſhip his *Latin* Verſion.

Cum curva auxilio veniunt Teſtudine—— —
Quæ Pelagi fluctus velocibus innatant alis,
Aut moutana etiam Cytiſo quæ veſcitur & quam
Reddidit e muta modulanti voce canoram
Mercurius, picto inſontis qui Cortice carnem
Exemit, geminumq; Ancona intendit in oris.

Jacobus Grevinus in his Treatiſe *de Venenis* in the Chapter *de Salamandra* pag. 119. gives us an ample Comment on theſe Verſes, and relates at large the Hiſtory of the firſt Lyre, which I refer your Lordſhip to, rather than tranſcribe it here; but this I cannot but take notice of (by way of Supplement to what he ſays) this Verſe—

Αὐδήεσσαν ἔθηκεν ἀναύδητον περ ἐοῦσαν;
Reddidit e muta Modulauti voce canoram——

—Is ſo home and appoſite to our preſent purpoſe, and comes up ſo cloſe to *Horace*'s Thought.

O mutis quoq; Piſcibus
Donatura Cygni ſi libeat ſonum.

That it does not only explain the true meaning of it, but makes me inclinable to believe the *Roman* might have in his view this very paſſage of the *Greek* Poet when he writ theſe Lines; for whoever is moderately converſant in the *Greek* and *Latin*, will eaſily be of opinion, that the latter frequently borrow'd not only their thoughts and fancies from the former, but even ſometimes they copied as near as poſſible, their very turns and expreſſions, conſidering they writ in a differing Language; yet this muſt be allow'd, they uſually ſurpaſſed thoſe they drew from, and the Copies went beyond their firſt Originals, as *Horace* I think has here outdone *Nicander* in his fancy, which I perceive he has been ſo fond of, that he was not only ſatisfied to uſe it in this place, but has it again, tho not ſo fully and expreſsly in his 11th Ode of the 3d Book, where he invokes his Lyre in this manner.

Tuq; Teſtudo reſonare ſeptem
Calida nervis
Neque Loquax olim neque grata—

Which laſt Line is a plain comment to ſhew what he means in this place.

O mutis quoq; piſcibus
Donatura ſonum, &c.

The other inſtance I ſhall mention, is from one of *Lucians* Dialogues, who writ above a hundred years after *Horace*, whence 'tis plain the Mechaniſm of the Ancient Lyre, and the Opinion concerning its firſt invention, prevail'd ſince as well as before *Horace's* days. In this Dialogue he introduces *Apollo*

Apollo and *Vulcan* talking after his jaooſe way of *Mercury* to this purpoſe.

> Απ. χελώνην που νεκρὰν εὑρὼν, ὄργανον ἀπ᾽ αὐτῆς συνεπήξατο, πήχεις γὰρ εναρμοσας, ϗ ζυγώσας, ἔπειτω καλάμους ἐμπήξας, καὶ μαγάδιον ὑποθεὶς, κατὰ ἐντεινάμενος ἑπτὰ χόρδας, μελοδεῖ πάνυ γλαφυρὸν ὦ Ηφαιςε καὶ ἐναρμόνιον.

Which might be better tranſlated thus to expreſs the Authors ſence, than as the *Latin* Editor has turned it.

> Ap. *Teſtudinem mortuam alicubi offendens Inſtrumentum ex ea concinnavit ; Brachia enim adaptans Jugum oppoſuit, deinde Clavos inſigens, & Hæmiſphærium repandum in fra ſubjiciens, ſeptem Cordas extendebat. atq; modulabatur quiddam valde ſonorum O Vulcane & ad Muſicæ Melodiam compoſitum.*

I thought it not amiſs to ſet down *Lucians* words at length, not only becauſe they are clear and full in the point, as to what the Muſical *Teſtudo* of the Ancients was firſt made of, but becauſe they accurately deſcribe and enumerate all its parts giving each its peculiar name : So that they as well ſerve to explain the following Figure, as manifeſtly ſhew 'twas really taken from a genuine piece of Antiquity.

I borrowed the firſt of the following Figures from that excellent Treatiſe of the Harmonicks of the learned Father *Marinus Merſennus* (*lib.* 1. de Inſtrumentis pag. 7.) and have added it as a ſurpluſage if your Lordſhip ſhould ſtill require a further and ſtronger proof of what I here advance, for this being taken from the things themſelves, that will not lie and, cannot deceive, as Words and the dubious ſence of old Authors may, I thoughr it might carry with it a greater evidence than what I have yet ſaid.

Figure the firſt repreſents the Ancient *Lyra* or *Teſtudo*, and the Father tells us he copied this Figure (which I have expreſt in ſomewhat a larger ſize, that it might the better agree with the proportion of the annext Scheme) from the Sculpture of an Antique Gemme that bolong'd to one *Jacobus Gaffarellus* A A ſhew the πήχεις of *Lucian* the 'Αγκώνες or *Brachia* of *Nicander*, made of the Horns of ſome Beaſt B the Ζύγος or *Jugum*, in which were faſtened the κάλαμοι *Clavi* Pegs that raiſed or depreſt c. c. the χορδαι or Strings, which were fixt at their t'other end to D the μαγάδιον *Hemiſpherium* or Belly. Of the Lyre of this part of the Inſtrument the good Father not having, I ſuppoſe, well conſider'd, or throughly inquired into the matter, ſays, that it ſeem'd *Teſtudinis Dorſum Ventrem ſeu Teſtam repreſentare*; whereas 'tis plain 'twas more than a reſemblance, and was really deſigned to expreſs the thing itſelf; as appears by the ſecond Figure of an intire *Teſtudo Aquatica* or rather *Fluviatilis*, as *Cicero* calls it (in his *Natura Deorum*) taken from *Johnſtonus de Animalibus* as delineated in his eightieth Table *de Quadrupedibus*.

Whoever compares theſe two Figures, tho but little converſant in the natural Hiſtory of Animals, and will but make allowances for their different poſture, one being repreſented full and in a flat poſture, whilſt only half of the t'other appears, becauſe 'tis ſhewn ſide ways, will ſoon be convinc'd of this truth.

For if we obſerve how the Belly of *Merſennus* his Antient Lyre markt D. agrees nicely in Figure and Shape with the Back or Shell of *Johnſtonus* his *Teſtudo Aquatica*, markt E. how they are both curiouſly teſſelated and checker'd into Areas or Scales F. F. F. F. F. F. of ſomewhat a Square Figure, and each of theſe Scales again in both ſo neatly wrought about their edges with a line running parallel to their Margins g. g. g. g. g. g. and how the Shell of the Lyre, as that of the Tortoiſe, terminates in a narrow Limb or Verge, cut into ſmaller Scales h. h. h. h. h. h. incompaſſing the whole; whoever, I ſay, remarks this accurate agreement of the two

Figures in all theſe particulars muſt at the firſt view be ſatisfied they were taken from the ſame object, and tho drawn by different Artiſts, may be at two thouſand years diſtance, yet both manifeſtly own the lineaments of the ſame natural Original.

This too fully appears from a paſſage in *Pauſanias* his deſcription of *Greece*, as I find it quoted by *Geſner* (for I have not the Author himſelf by me) which mentions a Mountain in *Arcadia* called *Parthenius Mons qui Teſtudines exhibet ad compingendas Lyras aptiſſimas*; and the ſame Author again ſays in another place, *Arcadum Querceta ingenti magnitudine Teſtudines exhibent, ex quibus Lyras conficeres æquales illis quæ ex Indica Teſtudine componuntur.* From whence 'tis plain the Ancients made their *Lyres* of the Shells of *Tortoiſes*; and we may likewiſe conclude from hence, that in the beginning of times, e're the skill of Muſick, or the art of making its Inſtruments arrived to any perfection, the greateſt Maſters in both ways were not over-nice and curious in the choice of their materials, but promiſcuouſly the *Land* or *River Tortoiſe* to make their Inſtruments of, as this or that came more opportunely in their way, which occaſions *Pauſanias* and *Nicander* to mention the *Mountain* whereas *Horace* ſpeaks of the *River Tortoiſe*; of which therefore we may ſuppoſe his *Lyre* was made.

And indeed, if we conſider the true riſe or way of Invention of all the ſorts of Tools, Weapons, Machines and Inſtruments that now prevail in the World (eſpecially thoſe of Muſick which are what we are now diſcourſing of) from their firſt Beginnings, we ſhall find they conſtantly derived their Origine, and borrowed their firſt materials from ſomewhat that was natural, rude, plain, ſimple and eaſy to come at, thus all the variety of curious Pipes now in uſe, as the *Flute*, *Flagelet*, *Hautboy* and *Organs* themſelves, tho ſo artificially contrived and exquiſitely wrought, certainly owe their Beginnings to, and are only refined improvements of the *Tenues Avenæ* or *Oaten Pipes* of the Field, or the *Calami impares Juncti* of the Ancients, *Reeds* of unequal lengths rudely put together ; and thus we ſee the Trumpets of old, were at firſt made only of rude *Horns* the eaſy ſpoils of Beaſts, and ſometimes of the common *Buccina Whelks* or large Sea ſhells that were obvious, and readily found on every Rock or Sea ſhore, hence that of *Virgil.*

Rauco ſtrepuerunt Cornua cantu.

And that of *Perſeus*,

Buccina jam priſcos cogebat ad arma Quirites.

And afterwards when the *Roman* People inlarged their Empire, grew more polite, and all their Mechanick Arts received mighty improvements, tho they had then learnt to make theſe ſame Inſtruments of different and more commodious ſhapes, and framed them of quite other ſorts of materials, yet ſtill they retained their firſt old Names, and ſo the *Teſtudo* did, by which we might as eaſily trace it as theſe to their primitive originals.

For 'tis very manifeſt, that in ſucceeding Ages, as the skill of the Mechanick Artiſt, that wrought and contrived the *Lyre*, as well as that of the Muſician that uſed the Inſtrument, arrived at a greater height, the model of the old *Teſtudo* was much alter'd, the number of the ſtrings increaſed, and the ſhape ſo mightily diverſifyed, that at length they wholly laid aſide the *Tortoiſe ſhell*, and the ſonorous part or Belly of the Lyre, was made of ſuch different Figures, that they bore not the leaſt reſemblance to its firſt model.

This plainly appears from thoſe other Schemes *Merſennus* gives us in the ſame Table of ſeveral ſorts of the Ancient Lyres (but theſe I take to be more modern than that which is here expreſt) and from thoſe deſcribed by *Leonardo Agoſtini*, in the ſecond part of his Collection of the *Gemme*

Antiche, which ſhew us, that as the fancy of the Workman, mode of the times, real convenience or an imaginary Beauty in the Inſtrument determined it, they were faſhioned into various ſhapes, and frequently like their *Lamps* of old into capricious fantaſtical odd Figures.

Thus, my Lord, I have ventur'd to give you my Thoughts towards the recovering the true ſence of an obſcure paſſage in one of the beſt of the *Latin* Poets, and have endeavour'd to ſet in a clearer light, a dark piece of Antiquity relating to the old *Greek* and *Roman* Lyre; yet after all, I muſt own 'tis too much a trifle to trouble your Lordſhip with, and I cannot but expect you will ſecretly blame me in your Thoughts, for taking up ſo much of yours and my own time, in proſecuting ſuch *Difficiles Nugæ* as theſe are, when I might have imployed it in ſomething far more uſeful to us both: If you cenſure me thus, all I will ſay is, you could not deſire one better diſpoſed, readily to acknowledge his fault than truly I am; and in token of my future amendment, I promiſe your Lordſhip never to be guilty of the like again, and profeſs now 'tis paſt, it only pleaſes me as it gives me a new occaſion of ſhewing what I am always proud to own that I am,

My very good Lord,

Your Lordſhips

moſt Dutiful, Affectionate

and Humble Servant,

Dublin, Decemb.
14th, 1701.

Tho. Molyneux.

IV. *A Letter from Mr* James Young, *F. R. S. to Dr* Edward Tyſon, *F. R. S. concerning a Ball, extracted from a Perſon, who had ſuffered by it 30 years, in which was a Plumb-ſtone,*

Plymouth, Sept. 6. 1702.

Worthy Sir,

WHen I had laſt the Honour to be at a meeting of the Royal Society in *Greſham* College, there happened in a diſcourſe concerning Plumbs, which gave me occaſion to tell you of one detained in the Guts of a Woman above 30 years, cauſing ſtrange and grievous accidents, till I drew it out *ex Ano:*

According to my promiſe then, I ſend you now a more particular account of that wonderful caſe and cure than I could give by meer memory.

Her name is *Sarah Swayn*, of a thin habit and middle ſtature, who when but ſix years old, was firſt afflicted with a violent pain, together with a large hard ſwelling on the left ſide of her Belly, which laſted twelve hours, and then went off without uſe of any Remedy or ſenſible evacuation; and at the end of three months returned, laſted and went off as before.

Several years it obſerved that Period, and then changed its intermiſſion from 3 months to 3 weeks, and ſo continned till ſhe was 35 years old, in which time ſhe married, and bore one Child, the pain of which ſhe averr'd to be much leſs than what theſe *Paroxiſms* gave her.

During her pregnancy, her Pains nor Intermiſſions had no alteration, and in her whole Life ſhe found no Diet diſturb'd her but Milk and Salt Meats.

About 9 months before ſhe was cured, the Pain and Tumour encreaſed to the bigneſs of a mans two Fiſts, ſhe endeavoured by many Remedies to get eaſe, but in vain, till the torment and watching had ſo weakned her, that ſhe could not riſe out of her Bed nor lie down in it.

In this deplorable condition ſhe was adviſed by a Woman to take a doſe of Powder'd Jalop, what the quantity was I could not learn, but it operated violently, and ſuddenly drove the pain from her ſide down to the *Anus*, where it reſembled a *Teneſmus*, *viz.* a conſtant and violent inclination to ſtools without being able to force off any thing, and after ſhe had been thus crucified four days her Urine alſo ſtopt, and two days after that the charitable Neighbours, who had all along given her their beſt aſſiſtance craved mine.

I perceived by their report of the matter, that ſomething obſtructed the paſſage of her Excrements, and ſoon found it ſo by a probe; I then anointed the paſſage with *Populkeum*, and taking hold of the ſubſtance with a pair of large Forceps, made to extract Stones from the Bladder after Lithotomy, I drew it forth.

Abundance of Wind and Excrements guſht out, and continued to flow till her Guts were emptied of all the matter, which had been ſo long retained; after which I ordered her an Anodine Clyſter, and a compoſing draught, and ever ſince (being ſeveral years) ſhe continueth well.

The thing extracted was round, ſomewhat oblong, having on it ſome ſuch impreſſions, as mens Fingers make on Wax or Plaiſter. It then weighed 10 Drachms, now ſcarce an Ounce, it was 5 inches in circumference, and altho it felt and otherwiſe appeared a Stone, it ſwam on Water, which made me ſee the inſide of it by cutting it in two with a Knife, externally it was black, and ſmooth as if varniſht, and no thicker, which made me before I had conſidered the whole, think it the expanded ſkin of the Plumb indurated; next to this thin blackneſs was a cruſt of matter like Brick, the thickneſs of an half Crown, within that appeared a ſubſtance reſembling Paſte-board or chewed Paper, and within that lay a Prune or withered Plumb, with the Stone and Kernel cut aſunder by my Knife.

I have ſent it for the R. Society to examin, who I preſume will think that all thoſe wonderful accidents, which ſo long moleſted this poor Woman, were occaſioned by this Plumb ſwallowed ſo many years before; but how thoſe different accretions were made to it in ſuch a place as the Inteſtines? how it ceaſed to torment her at ſo many and ſuch different Intervals? where it lurked between thoſe Fits, and how the Pain and Tumour obſerved ſuch exact Periods for ſo many years; at firſt every three months, and afterward every 3 weeks? are queſtions I am not able to reſolve.

Many Authors tell us of various Stones ejected by Stool, and of late many of them have been found to come out of the Gall Bladder through the Cholerick Channels of Jaundiced People. I have ſeen two ſuch bigger than any I have read of, one ſo big as a Pullets Egg, which came from a Lady in the operation of a ſtrong Cholagogue taken for a Jaundice that had reſiſted many other Remedies, the other as big as a large Nutmeg, driven out by the ſame means from an aged Man languiſhing in the ſame diſtemper, and both of them for many days after thoſe Stones came off, evacuated great quantities of Choler by Stool, and were freed of the Diſeaſe.

Miſcell. Cur. vol 2. obſ. 89. 136.
Act. Med. Barth. vol. 5. ob. 65.

That thoſe two Stones were generated in the *Folliculus Fellis* or *ductus Choledochus*, no man will doubt who conſiders the conſequence, and knows that in colour, taſte, weight and ſhape, they reſembled ſuch as are found in thoſe parts upon diſſection of Jaundiced Bodies. I once ſaw near an handful of them taken out of the Gall Bladder of the *Portugal* Ambaſſador that dyed in *London*, 1679. and we are lately told by *Baglivius*, that the famous *Malpighius*'s was full of them, they uſually are of ſubcitrin colour, reſemble bright Myrrh, and ſeem an aggregate of ſmall Stones, which

Perhaps are made ſingly in the *veſicula*, and Coaleſce in the *Ductus*.

The conſequence of their coming off ſhews, that they cauſed the Jaundice in thoſe two perſons I have mentioned, by obſtructing the Channels thro which the Bile paſſeth from the common receptacle into the *duodenum*. It may perhaps ſeem impoſſible to ſome men, that ſubſtances of that magnitude could paſs thorough a *Meatus* ſo ſmall as the common *Ductus* is. But it hath been no wonder to me this twenty years, ſince I diſſected a Phyſician of this place, who dyed of the Jaundice, and found the *Ductus Communis* large enough to admit my greateſt Finger, as 3 Phyſicians and one Surgeon beſides myſelf, ſaw to our great ſurprize.

Thoſe Stones which are generated in the Gutts are of another ſort, and eaſily diſtinguiſhable from thoſe I am Writing of. *Beckers* ſpeaking of ſome Stones voided by Stool, ſaid ——*Calculos illos in Inteſtinis genitos eſſe, quia Colore, pondere & figura a choledohis lapillis diſtincti Arbitratus ſum.* Thoſe generated in the Gall cauſe the Jaundice, thoſe in the Guts, beget Cholical, Splanchnical, Hypocondriacal Pains, and ſometimes Nephritical, all which vaniſh when they are ejected.

Vol. 3. *obſ.* 110. I have ſeen Lumps of Stones in a Herſe as big as a Tennis Ball taken out of a Bullocks Guts. The Authors of the *German* Miſcellany write of one very much bigger. *L. Riverius* of a man that continually with all his Stools voided *Ad. Med. vol.* 1. *obſ.* 100. *vol.* 5. *ob.* 65. Stones like thoſe generated in the Kidneys. *T. Bartholine* mentions ſeveral, one particularly notable, being ſo big as a Pidgeons Egg, which was purged off from a Woman by a gentle Pill. ——*in exteriore ſuperficie ſubcinereum, & dum a me clavo ferreo in duas aquales partes diffringitur interius inſtar cryſtalli albicantem & Rutilantem, ita ut qui olim ex* Enni *ſtarcore aurum, hic colligere potuiſſet gemmas.*

There are many ſuch in the *Miſcell. Cur.* and which reſembles mine, vol. 7. obſ. 90. but there is one much *lib.* 25. *cap.* 19.

more ſo in *Ambr. Pary, lib.* 25. *cap.* 19. but neither of them ſo ſtrange in cauſe or effects as mine.

It's not for want of old Authorities that I have here quoted few but Moderns; I know *Galen*, *Crato*, *Sennertus*, *M. Donatus*, *Z. Luſitanus*, *Fernelius*, *G. Horſtius*, *Schenckius*, and many more before this Age, who have told the world of Stones generated in, and ejected from the Inteſtines of diſeaſed people, but none that I know with ſuch ſurprizing circumſtances as this ſent you by

S I R, *Your moſt humble Servant*,

James Yonge.

The Ball intire is figured No 3, and its inſide and Plumbſtone by it.

V. *Some inſtances of other perſons who were hurt by ſwallowing Plumb-ſtones, by the Publiſher.*

THe diſcourſe mentioned in the beginning of the foregoing Letter was concerning Plumb-ſtones which had been ſwallowed by ſome perſons, and had been the cauſe of their Sickneſs or Death.

The firſt was a Man in *Lancaſhire*, who being for many years ill of the Colic, and receiving relief from no Med'cine, deſired he might be diſſected after his Death, to ſee what might be the cauſe of his Diſeaſe. This was accordingly done, and they took out of one of his Guts a large Ball 6 inches about, of an ounce and half weight made up of a ſpungy matter which ſwims in Water, and viewed by a Microſcope, appeared to be made up of very ſmall, tranſparent Hairs or Fibres, wrought together, after the manner of the *Tophus Bovinus* taken out of the maws of Oxen. In the middle or center of it was a common Prune or Plumb-ſtone, which had been ſwallowed, and ſticking ſomewhere in the Guts, had gathered that ſubſtance about it which reſembled the ſmall Hairs on the skins of ſeveral Creatures or Fibers of Plants we eat. Dr *Charles Leigh* in his Natural Hiſtory of *Lancaſhire*, *&c.* in his firſt Table has figured this Fig. 4. He ſhewing me the ſame, I was deſirous to ſee what it was made of, and had it cut for that purpoſe, and found it of a hairy or fibrous ſubſtance, layer upon layer, or coat upon coat, over a Plumb-ſtone. This Ball with its Plumb-ſtone and ſeveral Coats, my very good Friend Dr *Leigh* was pleaſed to give me, and it is now in my poſſeſſion, and ſeems to be of the ſame ſubſtance with that mentioned by Mr *Yonge*.

The ſecond inſtance I ſaw of theſe Balls was by the means of Dr *Wm Cole*, who did me the favour to ſhew me a Letter he had from the Country, and ſome ſmaller Balls than the 2 before mentioned, which had in their centers Plumb-ſtones. The perſon he was conſulted for, had, I think, the Colick to a great degree, and had voided ſeveral of them, they were not ſo Sphærical, but of a compreſs'd figure, ſmooth on the outſide and glaz'd as ſome of the *Tophi Bovini* are ; and ſeemed within of the ſame ſubſtance with the former *ſtratum ſuper ſtratum* upon a Plumb-ſtone.

A third inſtance like theſe I ſaw, through the favour of the late Dr *Wm Stokeham*, who ſhewed me a Ball about the largeneſs of that I had of Dr *Leigh*, which had been voided by a perſon after great Sickneſs, and preſerved by the Patients Phyſician, who was one famous for practiſing Chymically ſome years ago, *viz*. Dr *George Thompſon*. He has wrote a large account of this caſe, and printed it in his *experimenta admiranda*, p. 67. *de Lithocolo*, I had this laſt Ball in my poſſeſſion ſome time, and in appearance it was of the ſame ſubſtance, but what was contained in it I could not tell, not being permitted to open it, but that Author tells us it had ſeveral Plumb and Cherry-ſtones in it. Theſe Balls ſeem to be form'd ſomething after the manner of *Bezoars*, which generally have ſome ſeed for their Center or *nucleus*, on which Coats of another ſubſtance are gathered.

Theſe inſtances are ſufficient to ſhew the folly of that common opinion, that the Stones of Fruit are wholeſome, for tho by Nature the Guts are ſo defended by the *Mucus Inteſtinalis*, that very ſeldom People ſuffer, yet if we conſider the various circumvolutions of the Guts, their valves and cells ;

and at the ſame time conſider the hair of the Skins of Animals we feed on, the Wooll or Down on Herbs and Fruit, the Fibres, Veſſels, and Nerves of Plants which are not altered by the Stomach, the ſame caſe may very eaſily happen. I once ſaw as ſtrange a Diſtemper, and almoſt as obſtinate and long as I ever met with, proceed from a great quantity of Strawberry Seeds which had lodged in the Guts, and after their diſcharge the perſon was eaſed. And I have heard of many beſides thoſe publiſhed, who have loſt their Lives by ſwallowing many Cherry-ſtones.

VI. *A Letter from Mr* Thoresby, *F. R. S. to the Publiſher, concerning the* Veſtigia *of a* Roman *Town lately diſcovered near* Leedes *in* Yorkſhire.

Sir,

IN obedience to your Commands, to acquaint the Society with any thing remarkable that occurs in theſe parts, this brings you notice of the diſcovery of the *Veſtigia* of a *Roman* Town, upon the *Moor* near *Adel* Mill, 4 miles from *Leedes*; 'twas found out accidentally by a Tenant of Mr *Arthington*, who endeavouring to plow part of his Farm, was retarded by a great quantity of Stone, immediately below the ſurface of the Earth, which he was forced to dig up before he could proceed, and has already out of the Foundations of Houſes, which they traced on both ſides the Street, got ſo many Stones as has built above 100 rods of Walling. At a very little diſtance is a *Roman Camp* pretty entire, 'tis above 4 Chains broad and 5 long, ſurrounded with a ſingle Vallum, which from the top of the Agger to the bottom of the Trench is yet 22 foot deep in the place I meaſured, but the extremity of the weather prevented ſo particular a Survey as I

deſigned.

deſigned. The Town ſeems to have been of conſiderable note by the *Inſcriptions*, and fragments of *Statues*, *Pillars*, *&c.* there dug up, all which are (as Dr * *Liſter* has truly obſerved, that moſt of the *Roman Monuments* in theſe parts) made of the common ſort of courſe Rag or Millſtone grit, of which are alſo the remains of a large *Aquæduct*, in Stones of a great length and about ¾ of a yard thick, wherein the paſſage for the Water is about 6 inches broad and as many deep, almoſt double to thoſe of Clay found in the *Roman* Burying-place at *York*, formerly accounted for (No 234. of the Tranſactions) one of which is in your Repoſitory at *Greſham* Colledge. Some time ago here was dug up a *Statue* to the full proportion of a *Roman* Officer, with an Inſcription, both which periſhed through the brutiſh ignorance and covetouſneſs of the Labourers, who in a ſuperſtitious conceit, bound wythys or wreaths of Straw about the poor *Roman* Knight, and burnt him, in hopes of (by I know not what Magical Apparition in the Smoke) finding ſome hid Treaſure, and after in anger at their diſappointment broke him to pieces, of which only the Head is now forthcoming; but the 2 Inſcriptions lately diſcovered there fell into a more intelligent hand, one *John Robinſon*, whoſe induſtry and ingenious contrivance of binding a ſmall Engine to the Wriſt of his Arm, to ſupply the place of his Fingers, which through the careleſsneſs of a Servant were burnt off in his Infancy, pleaſed me well. *Cyril Arthringoon* of *Arthrington*, Eſq;, who is Lord of the Mannor, made me a preſent of theſe Inſcriptions, the one is but a fragment, yet has enough to diſcover it to have been ſepulchral, by the H S E for *Hic ſitus eſt*, below *PIENTISS*, the other is almoſt entire, and is evidently a *Funeral Monument*, it begins as uſually with *Dijs Manibus Sacrum*, and ends *Vixit Annos X*, as it ſeems to have been by the vacancy, 'tis one foot thick, 2 broad and 3 high, the Letters are very large, full 3 inches long, ſome of them interwoven, as AND (AD) and ED (as I apprehend the Eↄ to be) in *Candiedianæ*. The form of the Letters, and particularly the A may perhaps diſcover the Age that this *Roman* Station flouriſhed in, *viz.* in *Severus*'s Reign (*An. Dom.* 194) or before, if the * obſervation of the Prince of our *Engliſh* Antiquaries hold good, and I know none of the modern Criticks that diſſent from it.

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* *Phil. Collections No 4. p. 90, 91.*

* *Camdens Britannia* N. E p. 808.

'This obſervation (ſays he) I have made, that from the 'Age of *Severus* to that of *Gordian*, and after the Letter A 'in the Inſcriptions found in this Iſland, wants the croſs 'ſtroke, and is engraved thus Λ.

It ſeems to have periſhed, and perhaps was burnt down (as by the ſlag and aduſt colour in ſome places may be conjectured) in ſome of the Inſurrections of the Native *Brigantes*, who were impatient of Reſtraint.

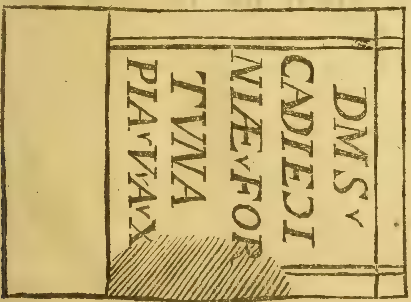
Amongſt the ruins were found 2 or 3 *Millſtones* for the grinding of Corn, which by the ſmallneſs of the ſize (20 inches broad) ſhew that the *Romans* of thoſe, as well as the *Egyptians* and *Jews* of former Ages, made uſe of their Slaves or Captives for that employ, who were placed *poſt molas*, Exod. xi. 5. *non precedunt ſed ſequuntur, brachijs & toto corpore trudentes*, what the old MSS Bibles have in reſpect of *Sampſon* (Judic. xvi. 21.) *clauſum in carcere molere fecerunt*, our *Saxon* Predeceſſors render expreſly hanꝺcƿyꞃne. (Mr *Thwait's Hept. Anglo Sax.*) beſides this, which is entire, I have a fragment of another Millſtone, whereon the Rows are yet remaining, but this being heavier, almoſt as thick at the Circumference as the other is at the Center (for they are convex on one ſide) I ſuppoſe might be the *Runner*, the Learned *Gataker* in his notes upon 47 *Iſai.* 2. obſerves, the Original word is of the *Dual form*, and that the Law prohibiting the taking the Millſtone to pledge, does particularly mention *Receb* or the *Rider*, becauſe that lying looſe might the more readily be taken off, and carried away upon that occaſion, and in his Annotations (which are incomparably the beſt of thoſe falſly aſcribed to the Aſſembly of Divines) upon *Landent. v.* 13. *they took the young men to grind*, ſays, the *Talmudiſts* have a Story, that the *Chaldeans* made the young men carry Millſtones with them to *Babylon*, where there was a great ſcarcity of them, whence probably their Paraphraſe renders that Text, *have born the Mills* or *Millſtones*, which might be true in a literal acceptation, they have alſo a Proverbial Speech of a Man with a Millſtone about his Neck (alluded to St *Matth.* xiix. 6. uſed of one that lyes under an exceeding heavy and almoſt inſupportable burden.

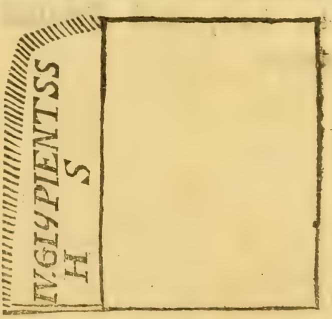
As we were traverſing the Ground, I found the fragments of *Urns* and other *Roman* Veſſels, one of which has been 23 inches, or two foot in Circumference, the generality of them are of the common red Clay, but I have alſo one of the beſt Coral coloured varniſh, and others of a bluiſh grey; as alſo a braſs Ring found in the ſame place.

The *Roman* rig that this Town ſtood upon, comes from the great Military Road upon *Bramhammoor*, of which *Leland* in his MS Itinerary, which by the favour of my Lord Archbp of *York*, I have a tranſcript of, as far as it relates to *Yorkſhire* or *Lancaſhire*, affirms, ‘I never ſaw in any part of *England* ſo manifeſt a token as here, of the large Creſt of the way of *Watlingſtreet* made by hands.

From thence this *via vicinnalis* paſſeth by *Thorner* and *Shadwel*, *Streetlane* and *Hawcaſter ridge* upon *Blackmoor* (near which is the *Roman Pottery* mentioned in ſome former Tranſactions) to *Adel*, thence thro *Cookridge* over the Moors towards *Ilkley* a known *Roman* Station, this ſame ridge is very evident in ſome part of the Grounds of *Tho. Kirk* of *Cookridge*, Eſq;, who ſhewed me the place where a *Roman* Monument in his poſſeſſion was dug up, it ſeems to have had a large Inſcription, but ſo eraced that nothing diſtinct can be made of it; perhaps the ſaid *Cukeryg*, as it is called in the Original Letters Pattents of K. *Edw.* 6th to Archbp *Cranmer* (now, with the Eſtate thereby conveyed in the poſſeſſion of the ſaid ingenious Gentleman) was ſo denominated from this *Roman* ridge which paſſeth directly thro it.

But what the name of this Station was I cannot divine, the learned Dr *Gale* ſome years ago gave me notice from an Anonymous Geographer, of a Station in *theſe parts* called *Pampocatia*, which he thought ſhould be read *Campocatia*, and had ſent into *France* for various Lections, concluding, ‘Where to place this I know not, but my hopes are, that you will be ſo happy as to find it, and ſo kind as to communicate the diſcovery, *&c.* now conſidering, that in the ſaid Author (Printed at *Ravenna*, *An. Dom.* 1688) this *Pampo* or *Campocatia* is the very next Station to *Lagentium* or *Legeolium*, it ſeems not improbable that this Camp, *&c.* was the very place; but becauſe things ſo many Ages paſt admit of various conjectures, I will offer another, which I am induced to from the ſimilitude of the Names, the *Agel* or *Adelocum* of the Ancients, and the preſent *Adle* or *Adel* as it is in the *Monaſticon Anglic.* 'Tis true, 'tis ſometimes writ *Segelocim*, but as Mr *Burton*, in his Comment upon *Antonius*'s Itinerary well obſerves, it is to be reckoned among thoſe Words to which the Ancients ſometimes put an S or *Sibilus* and ſometimes omitted; if this be thought too much Northward for that Station, which is placed South of *Danum*, it may be reply'd, that, not to inſiſt upon the tranſpoſition of ſome places, of which there are inſtances in the Itinerary, I ſee no inconvenience in admitting that the *Romans* might then, as we at this day, have ſeveral Towns of the ſame denomination; thus from an Altar in my poſſeſſion, inſcribed *CONDATE* (the whole Inſcription may be ſeen in the new Edit. of the *Brit.* p. 782.) the ſaid Learned Dean of *York* concludes that *Conſley* near *Piersbridge*, where this Altar was found, was as well called *Condate*, as *Congleton* in *Cheſhire*. And to me it ſeems highly probable, that the Legions being detached againſt the Enemy to diſtant places, might endeavour to leave ſuch Memorials of their removes, thus the *Legio viceſima valens victrix* uſually quartered at *Deva* or *Weſt Cheſter*, were detached into *Weſtmorland*, as appears by an Inſcription, and the *Lingones* who were ſeated at *Ilkley*, I queſtion not but were alſo at *Lingivel* near *Thorp on the Hill*, where the *Roman* Coyning molds (Phil. Tranſ. No 234.) were found, and that the intrenchments there were ſo denominated from them, the *Roman Vallum* being pronounced *Wallum*, of which ſee *Caſaubon*, *Somner*, &c. At this *Agelocum* or *Adelocum*, as *Cambden* himſelf once read it, is a Church of the moſt Antique form that ever I beheld, and being built of ſmall ſquared Stones like the *Roman* Wall and Multangular Tower in *York*, I verily thought it the remains of ſome *Roman* Temple, till I found in it ſome Chriſtian Hiſtories, particularly the deſcent of the Holy Ghoſt in the form of a Dove, done in *Baſſo Relievo*, but after ſo intolerably rude a manner, as ſufficiently evidences their great Antiquity. The Inhabitants have an old Tradition, that *Adel* Church once ſtood upon *Blackhill*, the place where theſe *Roman* Monuments were lately diſcovered, occaſioned perhaps by the removal of the Stones from ſome publick Edifice, at the deſtruction of the old *Roman* Town. But I am too tedious, and have ſcarce left place for the figures of the Monuments.





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Royal Society, at the *Princes's Arms* in St *Pauls* Churchyard, 1703.

ADVERTISEMENT.

THere having been lately Propoſed by Subſcription Mr *RAY*'s third and laſt Vol. of his *HISTORY* of *PLANTS*, whereby that whole Work is compleated, containing more Plants, and Deſcription of new *Species*, than all the Books yet extant on that ſubject; many hundreds being communicated from the Streights of *Magellan*, the *Philippine Iſlands*, and ſeveral Countries never ſearched of Plants before. By *F. Georgio Camelli* and other *Virtuoſi*, who either reſide, or have made careful remarks in the reſpective places; all diſpoſed in an eaſie method, to be found by their Tribes and Characteriſticks; with an account of ſuch parts of them as are either Specificks for ſome Diſeaſes, as the *Peruvian Bark*, *&c.* or are Univerſal Medicines, as *Faba St Ignatii*, *&c.* beſide many peculiarities belonging to particular Plants, every where occurring in the Work. The ſame is already well advanced at the Preſs, as may be ſeen by the Sheets printed off at the Undertakers *SAM. SMITH* and *BENJ. WALFORD*, Printers to the Royal Society, at the *Prince's Arms* in St *Paul's* Church-yard. Of whom Propoſals may be had, and Printed Receipts given for the firſt payment.

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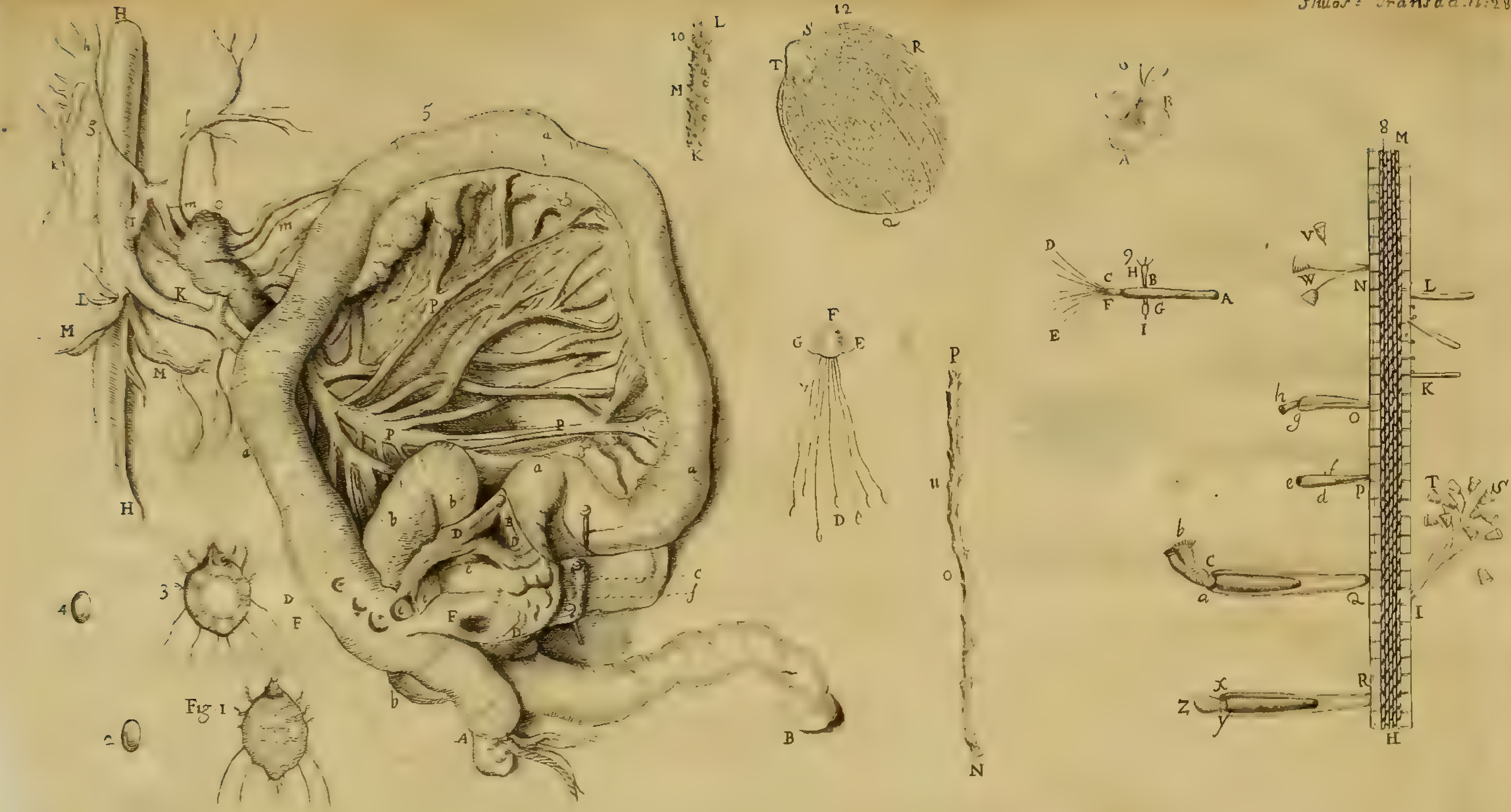
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(Numb. 283.)

PHILOSOPHICAL TRANSACTIONS.

For the Months of January *and* February, 1703.

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II. *An Abſtract of Dr* Mead's *Mechanical Account of Poyſons ſent to the Publiſher, by Mr* Sam. Morland.

I. *Part of a Letter to Dr* Mead, *concerning* Secretions *in an Animal Body.* *By* Joſ. Morland, *M. D.*

——— ANd indeed no one who has endeavoured to explain the manner, by which *Secretions* are performed, ſeems to me to have given a ſatisfactory account of that matter; nor do I doubt, but that a man of your ſagacity and skill in theſe affairs, can diſcover the defects of the ſeveral opinions of the Authors concerning them.

I ſhall therefore propoſe my opinion as briefly as I can.

It ſeems to me, that the whole Buſineſs may be reduced to this double enquiry. 1ſt, How a thin Fluid (ſuch as is the *Urine*) may be ſeparated from the Maſs of Blood, and the remaining parts of the Blood, circulate back to the Heart. 2dly, How a thick Fluid (ſuch as is the *Bile* or *Semen* for example) may be ſeparated from the Maſs of Blood, and the other Fluids both thinner and thicker than this particular Fluid to be ſeparated, circulate back to the Heart. And that I may be the more plain, I ſhall give a general Idea of the ſtructure of the Glands. A Gland I conceive to be compoſed.

1ſt, Of the Ramifications of the Blood Veſſels incloſed in a common Membrane, which ſends off ſeveral Fibres, by which theſe minute Veſſels are tied together; and that the Veins are a continuation of the Arteries. Of this Dr *Areskin* has fully convinced us, by an iniection of Wax in an Hnmane Body, ſo dextrouſly performed, that the Wax being injected by the Arteries filled the Veins at the ſame time; and afterwards by a nice diſſection of the part, where the continuation of the ſmall Ramifications of the Arteries and Veins appeared to the naked Eye.

2dly, I conceive, that when the Branches of the Arteries begin to grow very ſmall, they ſend off ſeveral ducts, whoſe Orifices are of different Dimenſions. Theſe Ducts are of 2 ſorts.

The Firſt of theſe, which in the ſame Artery are always ſmaller than the 2d, paſs immediately from the Artery, and open into the Veins.

The Second which paſs off nearer to the extremity of the Arteries, unite and carry off a Liquor from the Maſs of Blood for particular ends in ſeveral parts of the Body. It is to be obſerved, that in one caſe the ſecond ſort are only to be found.

I imagine, that a thin Fluid may be ſecern'd from a thick one, when the Orifices of the ſecretory Ducts are ſo ſmall, as to admit no other but that thin Fluid, and that at the ſame time the remaining parts of the Blood which are thicker, continue their courſe in the Veſſel.

Again, I imagine that a thick Fluid may be ſecern'd, when the thinner parts are carried off ſome other way, ſo that the Liquor to be ſecerned will be the thinneſt of the remaining Maſs.

Upon theſe principles I think it will be eaſie to explain the Doctrine of Secretions. And now *In the firſt place* Let us examine how the thinner Secretions are performed: As for inſtance, the Urine.

When the Blood by the Contraction of the Heart is puſht into the Arteries, they are dilated, which again contracting themſelves puſh it forward into all the parts of the Body, and amongſt the reſt into the Ramifications of the Arteries of which the Glands of the *Kidneys* are compos'd. By this means the Blood paſſes by the Orifices of the *Secretory ducts*; when theſe Arteries contract themſelves they preſs the Blood and force the thinner parts into the Orifices of thoſe Ducts, (which will admit no Thicker Fluid) and carry it toward the *Pelvis* and the remaining part of the Blood, into the Veins, by them to be carry'd back to the Heart. Thus a

Thin Liquor may be ſeparated from the Maſs of Blood

In the Second Place Let us examine how a Thick Liquor may be ſeparated from the Maſs of Blood where thinner Liquors are mixt with it.

For inſtance, let us take the *Gall* or *Semen*.

When the Blood is puſht into the *Celiac* or *Meſenteric* Arteries, 'tis forced to paſs into the Glands of the *Stomach*, *Pancreas*, *Spleen* and *Inteſtines*, &c. where the *Liquor Gaſtricus*, *Succus Pancreaticus*, *Liquor inteſtinalis*, are ſeparated by the above-mention'd method. The Blood thus robb'd of various thin Liquors is puſh'd on into the Veins, which anſwer to theſe Arteries, which Veins unite, and form a large Trunc called the *Vena Porta*, which entering into the ſubſtance of the Liver, by its ſmall Ramifications chiefly forms the Glands of which the Liver is compos'd. Here again all the Fluids contain'd in the *Vena Porta*, which are thinner than the Bile, are ſeparated from this Maſs of Blood by the firſt ſort of Secretory Ducts (which we ſaid opened into the Veins) and there are diſcharged and mixt with the Blood, which is paſſing toward the Heart, At the ſame time the *Bile*, with the reſt of the Blood which is thicker, continues its courſe in the Artery: Now all the thin Liquors being ſeparated the Bile is the thinneſt part of this Maſs of Blood, and ſo may be received by Excretory Ducts, which are capable to receive it, and no other.

The *Semen* being a very thick Liquor is ſeparated much after the ſame manner. *viz.* The Blood being puſht into the *Spermatick* Arteries, paſſes into the ſubſtance of the *Teſticles*, where all the Liquors that are thinner than *that* out of which the *Semen* is to be taken are ſeparated by the firſt ſort of Secretory Ducts, and carried back to the Maſs of Blood. Then this *Liquor Seminalis* being the thinneſt part of the remaining Maſs is ſeparated by Encretory Ducts, capable to receive it and no other. After the *Liquor Seminalis* is ſeparated from the Maſs of Blood by the aforeſaid method, it is puſht forward into the Encretory Ducts, where there are other Ducts, which take their origin all a long from them, which Ducts are capable to receive the thinneſt parts of the Liquor *Seminalis*, and convey them to the Maſs of Blood ; and thus the *Semen* is left behind to paſs into the *Vas deferens*.

And 'tis worth remarking, that as the *Semen* grows thicker and thicker by continual ſeparation, the Canal in which it is to run, grows larger and larger, as appears by the ſtructure of the *Teſticles Epididymis* and *Vas Deferens*. Hence we may give a true account, why the Canals of which the Teſticles are compoſed, are ſo long. *viz*. That there might be time enough to ſeparate all the thin Fluids.

By this method we ſee, how the thickeſt and thinneſt Fluids may be ſeparated from the Maſs of Blood. And how intermediate Liquors may be ſeparated after the ſame manner by Canals of intermediate Dimenſions.

Thus in a word the whole Doctrine of Secretions may be reduc'd to this.

To ſeparate a Liquor of any determin'd thickneſs, all the Fluids, which are thinner, muſt be carry'd off by ſmall Canals, and the Liquor to be ſeparated, being the thinneſt of the remaining Maſs is ſecerned, becauſe the Ducts are capable to receive it and no other.

Corollarys.

1. Hence the uſe of the Spleen is evident.
2. Hence appears the origin and uſe of the Lymphaticks.
3. Hence the Texture and uſe of many minute parts of the Body may be diſcovered, which hitherto has been unknown.

You know, Sir, of how great moment ſuch conſiderations as theſe are to the knowledge both of the Cauſe and Cure of many Diſtempers ; having already in ſome degree convinc'd thoſe, who are the only capable Judges of theſe matters, that *Mechanical Enquiries* into the Animal OEconomy, are the beſt Foundation, upon which we can ſafely proceed in the Practice of Phyſick.

II. *An Abſtract of part of a Letter from Dr* Bonomo *to Signior* Redi, *containing ſome Obſervations concerning the Worms of Humane Bodies.* *By* Richard Mead, *M. D.*

HAving frequently obſerved that the Poor Women when their Children are troubled with the *Itch*, do with the point of a Pin pull out of the Scabby Skin little Bladders of Water, and crack them like Fleas upon their Nails; and that the Scabby Slaves in the *Bagno* at *Leghorne* do often practice this Mutual Kindneſs upon one another; it came into my Mind to examine what theſe *Bladders* might really be.

I quickly found an *Itchy* perſon, and asking him where he felt the greateſt and moſt acute *Itching*, he pointed to a great many little *Puſtules* not yet Scabb'd over, of which picking out one with a very fine Needle, and ſqueezing from it a thin Water, I took out a very ſmall white *Globule*, ſcarcely diſcernible: Obſerving this with a Microſcope, I found it to be a very minute Living Creature, in ſhape reſembling a Tortoiſe, of whitiſh colour, a little dark upon the Back, with ſome thin and long Hairs, of nimble motion, with ſix Feet, a ſharp Head, with two little Horns at the end of the Snout; as is repreſented in Fig. 1 and 3.

Not ſatisfied with the firſt Diſcovery, I repeated the ſearch in ſeveral *Itchy* perſons, of different Age, Complexion and Sex, and at differing ſeaſons of the year, and in all found the ſame Animals; and that in moſt of the Watery

Puſtules, for now and then in ſome few, I could not ſee any.

And tho by reaſon of their minuteneſs, and colour the ſame with the Skin, 'tis hard to diſcern theſe Creatures upon the Surface of the Body, nevertheleſs I have ſometimes ſeen them upon the Joynts of the Fingers in the little Furrows of the *Cuticula*, where with their ſharp Head they firſt begin to enter, and by this Gnawing and Working in with their Body, they cauſe a moſt troubleſome *Itching*, till they are got quite under the *Cuticula*; and then 'tis eaſy to ſee how they make ways from place to place by their biting and eating, one ſingle one happening ſometimes to make ſeveral *Puſtules*, of which I have often found two or three together, and for the moſt part very near to one another.

With great earneſtneſs I examined whether or no theſe Animalcules laid Eggs, and after many enquiries, at laſt by good Fortune while I was drawing the Figure of one of 'em by a Microſcope, from the hinder part I ſaw drop a very ſmall and ſcarcely viſible white Egg, almoſt Tranſparent, and oblong, like to the Seed of a Pine-apple, as is ſeen in Fig. 2 and 4.

I oftentimes found theſe Eggs afterwards, from which no doubt theſe Creatures are generated, as all others are, that is, from a Male and Female, tho I have not yet been able by any difference of Figure to diſtinguiſh the Sex of theſe Animals.

From this Diſcovery it may be no difficult matter to give a more Rational account of the *Itch*, than Authors have hitherto delivered us. It being very probable that this contagious Diſeaſe owes its origin neither to the Melancholy Humour of *Galen*, nor the corroſive acid of *Sylvius*, nor the particular Ferment of *Van Helmont*, nor the Irritating Salts in the *Serum* or *Lympha* of the Moderns, but is no other than the continual biting of theſe Animalcules in the Skin, by means of which ſome portion of the *Serum* ouzing out

thro

thro the ſmall apertures of the Cutis, little watery Bladders are made, within which the Inſects continuing to Gnaw, the infected are forced to ſcratch, and by ſcratching increaſe the Miſchief, and thus renew the troubleſom work, breaking not only the little Puſtules, but the Skin too, and ſome little Blood Veſſels, and ſo making Scabs, Cruſty Sores, and ſuch like filthy Symptoms.

From hence we come to underſtand how the *Itch* proves to be a Diſtemper ſo very catching; ſince theſe Creatures by ſimple contact can eaſily paſs from one body to another, their motion being wonderfully ſwift, and they as well crawling upon the ſurface of the Body as under the *Cuticula*, being very apt to ſtick to every thing that touches 'em, and a very few of them being once lodged, they multiply apace by the Eggs which they lay.

Neither is it any wonder if this infection be propagated by the means of Sheets, Towels, Handkerchiefs, Gloves, *&c.* uſed by Itchy perſons; it being eaſy enough for ſome of theſe Creepers to be lodged in ſuch things as thoſe; and indeed I have obſerved that they will live out of the Body 2 or 3 days.

Nor in the laſt place ſhall we be at a loſs to know the reaſon of the cure of this Malady by Lixivial Waſhes, Baths, and Ointments made up with Salts, Sulphurs, Vitriols, Mercury's, Simple, Præcipitate or Sublimate, and ſuch ſort of corroſive and penetrating Medicines. Theſe being infallibly powerful to kill the Vermin lodged in the Cavities of the Skin; which ſcratching will never do, partly by reaſon of their hardneſs, and partly becauſe they are ſo minute as ſcarcely to be found by the Nails.

Neither do inward Medicines perform any real ſervice in this Caſe, it being always neceſſary after a tedious uſe of theſe to have recourſe to thoſe external ones already mentioned. And if in Practice we oftentimes Experience, that this Diſeaſe, when we think it is quite cured by Unction, does nevertheleſs in a ſhort time return again, this is not

ſtrange, ſince tho the Oyntment may have killed all the Living Creatures, yet it may not probably have deſtroyed all their Eggs, laid as it were in the Neſts of the Skin, from which they may afterwards breed again and renew the Diſtemper. And upon this account, 'tis very adviſable after the Cure is once performed, ſtill to continue the Anointing for a day or two more; which it is the eaſier to do, becauſe theſe Liniments may be made agreable enough, and of a good ſmell, as particularly is that compounded of the Ointment of Orange Flowers or Roſes, and a ſmall quantity of red Præcipitate.

III. *Obſervatio de portione inteſtini canis fæliciter abſciſſa, a* Joanne Shipton, *Chirurgiæ Studioſo.*

INteſtinorum vulnera, craſſorum quidem ut plurimum, tenuium verò ſemper lethalia eſſe, ab omni retro Antiquitate traditum eſt.

Acerbam de ijs *Divinus Senex* fert ſententiam. Aph. 18. lib. 6. Κύστιν διακοπέντι, ἢ ἐγκέφαλον, ἢ καρδίην, ἢ φρένας, ἢ τῶν ἐντέρων τι τῶν λεπτῶν, ἢ κοιλίην, ἢ ἧπαρ, θανατῶδες. *Ejuſdem* etiam *lib. Aph.* 24. Ἐντέρων ἢν διακοπῇ τῶν λεπτῶν τι, οὐ ξυμφύεται.

Omnem etiam eis ſpem adimit *Romanus Hippocrates*, *C. Celſus*. de ejuſmodi vulneribus ſequentia prædicens, *lib.* 5. *cap.* 26. *Servari non poteſt cui baſis cerebri, cui cor, cui Stomachus, cui iocinoris portæ, cui in ſpina medulla percuſſa eſt, cuiq; aut pulmo medius*, aut jejunum, aut tenuius inteſtinum, *aut ventriculus, aut renes vulnerati ſunt, cuive circa fauces grandes venæ, vel arteriæ, præciſæ ſunt. Vix autem ad Sanitatem perveniunt, quibus ulla parte pulmo*, &c. aut ullum inteſtinum *vulneratum eſt*. Eadem alibi lethalia pronunciat. *lib. ſc.* 7. *cap.* 16. *Si tenuius. inteſtinum perforatum eſt, nihil profici poſſe jam retuli Latius inteſtinum*

teſtinum ſui poteſt, non quod certa fiducia ſit, ſed quod dubia ſpes certa deſperatione ſit potior : interdum enim glutinatur.

Quinetiam *Faberit. ab Aquapendente* Neotericorum in Arte Chirurgicâ facile Princeps, ubi rationem, cur modus ſuendi inteſtina a *Galeno* & *Paulo* omittatur, reddit, eandem ſententiam experientiâ ſuâ confirmat. *lib. de Operat. Chirurg. cap.* 55, *de modo ſuendi vulnera abdominis. Etenim*, inquit, *inteſtinorum vulnus, ſi aliquod ex tenuibus ſit vulneratum, ſemper lethale eſt, quos ego vidi ut plurimum ſecunda die obijſſe, & raro ultra eorum vitam protractam eſſe. Craſſa autem inteſtina vulnerata & ipſa periculoſiſſima ſunt, ſed tamen interdum ſanabilia evadunt, ut experientia quotidie comprobat, &c.*

Quid autem plures citare refert? quæ enim Minorum Gentium Authores habent, ex *Coo ſene.*

(a quo, ceu fonte perenni,
Scriptorum Medicis ora rigantur aquis,)

omnes fere hauſerunt: Nec quiſquam aut medicus aut æger tam fælix hactenus inventus fuit,qui Aphoriſmi falſitatem propriâ experientiâ potuit evincere.

Equidem haud ignoro *Paulum Barbette* vulnus inteſtini tenuis aliquando curatum fuiſſe affirmare; quod etiam *exemplo inſigni probare ſe poſſe ait, Chirurg. part.* 2. *lib.* 2. *cap.* 11. Optâſſem profecto ut Clariſſ. vir hiſtoriam tam raram, tamq; omnibus veterum ſimul ac recentiorum ſententijs contrariam poſteris tradidiſſet, ut ita caſûs inſoliti circumſtantias ante oculos habentes, certius de eo judicium efformare poſſemus. Mirandum porrò, imò verò dolendum mihi videtur, inter tot tamq; illuſtres viros, qui eodem tempore & in eâdem civitate praxin excercebant, ſupellectilemq; medicam obſervationibus ſuis adauxerunt, neminem fuiſſe qui *inſignem* curationis hujus ſucceſſum memoriæ mandaverit. Nec vero Clariſſimo atq; optimè de Chirurgiâ merito Viro fidem denegamus, nec Aphoriſmi veritatem contra teſtis adeò locupletis experientiam mordicùs tuemur: Siquidem in Medicinâ nullum adhuc repertum eſt Axioma tam univerſale, quod aliquando poſterorum obſervationes erroris haud arguerint, nec quiſquam adeo omnibus numeris abſolutus Medicus extiterit, quem non interdum & falſum eſſe & feſelliſſe conſtat.

Inteſtinorum autem vulnera licet in humano genere periculoſiſſima eſſe omnes agnoſcant, in canibus vero eorum curationem longe minoris eſſe diſcriminis atq; negotij ſequens experimentum, quod *Nov.* 20. 1702. feci (præſente *D. Gul. Pleahill, Societ. Chirurg. Londin. Cuſtode Digniſſimo.* Præceptore meo plurimum honorando, adjutrices etiam manus commodante *D. J. Dobyns*, Juvene in Anatomicis pariter ac Chirurgicis Operationibus optimè verſato,) ſatis comprobabit.

Cane ex more ligato, vulnus abdomini ſatis amplùm infliximus proximam inteſtini Ilei partem extraximus vaſa; meſaraica,quæ eam irrigabant, ligavimus; inteſtinum tranſverſim duobus locis forfice diſſecuimus; ejuſq; portionem duos circiter digitos longam abſtulimus; tum inteſtini vulnus ſuturâ pellionum, abdominis interſciſſâ conjuximus; emplaſtro obteximus; vinculiſq; ſolutis, faſciâ obligavimus. Primo ingreſſu titubare æger, ceuvertigine correptus, debiliſq; admodùm eſſe videbatur; eadem noctebis vomuit. Poſt aliquot dies ſuturas aliquatenùs laxatas ſubmiſſis feſtucis, & circa fila contortis, arctius conſtrinximus. Poſteà medicamentis faſcijſq; abjectis intra tres ſeptimanas vulneri ipſe lambendo cicatricem induxit.

Obſervatione forſan non indigna videbitur inteſtini ſimul ac abſciſſum fuit, retractio; quod ex utraq; parte reſiliens arcteq; ſe occludens Sphincterem eleganter exhibuit.

Canem deinde poſt aliquot ſeptimanas, quibus ſanus admodum vegetuſq; degebat, ſuſpenſum aperuimus, partemq; inteſtini, quà conſutum erat, in hypochondrio ſiniſtro (ſatis longe ab externo vulnere, quod hypogaſtrio dextro inflictum erat) peritonæo (vid. Fig.   lit. f,) firmiter annexum,& in ſacculum ampliatum (D D D) invenimus. Omentum etiam (G) ei adhærebat, ut & inteſtina ibidem pluribus in locis (* * e e) ſibi invicem adnata erant. Ad cicatricem ab internâ parte (c) accuratius luſtrandam, inteſtinum juxta longitudinem incidimus, quo ex uno latere vulneris labia adducta, (D D D) & peritonæo connexa (t) ex altero eadem diviſa, proximiſq; adjacentium inteſtinorum partibus agglutinata fuiſſe apparebat; ita ut exteriores eorum tunicæ, internum ab iſto latere efformantes parietem, inteſtinalem fiſtulam continuarent, cibiſq; devehendis commode inſervirent, e. e.

Figuram inteſtini unà cum vicinis partibus Clariſſ. D. *Cowper* pro ſingulari ſua humanitate accuratiſſime delineare dignatus eſt.

Hæc quoniam aliquod rei Medicæ emolumentum afferre poſſent, atq; à nemine, qùantum ſcio, hactenus literis conſignata eſſent, perituræ mandare chartæ haud abs re duxi.

Brunneris quidem *in Præfatione ad Experim. nova circa Pancreas*, tenue canis inteſtinum ad unicam unam cum dimidia fauciâſſe ſe, cane (ægre licet) evadento commemorat.

Fælicius ſucceſſit eadem operatio Celeberrimo Anatomico *D. Cowper*, qui in *Actis Reg. Societ. Menſ. Febr.* 169¼, No 208. cani majori inteſtinum gracile ſecundum longitudinem diviſiſſe, cumq; ſine ejuſdem ſuturâ (conſuto tamen abdomine) abſq; moleſto ullo ſymptomate (idq; vel adhibito, vel omiſſo decantato tunc temporis *D. Colbatch Pulvere Styptico* brevi ſanaſſe ſe affirmat. Neutrum tamen horum inteſtinum diſſecuiſſe, aut quicquam ei abſcidiſſe ſatis conſtat.

Obſervationem prædictis haud alienam exhibet Excellentiſſ. *D. Wallis, Act. Reg. Societ. Menſ. Januar.* 169⅚ No 219. Equus ſibi palum ſaltu infigit; ſauciatur ventriculus; accerſitur (non niſi poſt aliquot horas) Veterinarius; ampliatur vulnus; conſuitur ventriculus; colligantur leviter abdominis vulnerati labia; immituntur turundæ; paucíſq; ſeptimanis ſanitas reſtituitur.

Quanquam autem hæc in brutis experimenta bene ſucceſſerint, tamen ſi quiſquam tam inhumanus foret, ut ſcienter, vel tam imperitus, aut infælix, ut inſcie, inteſtinum tenuius homini præcideret, nullus dubito, quin certum ei æque ac perfoſſo corde lethum inferret. Tenuia enim hominum inteſtina tantâ fibrarum carnearum compage haud gaudent, quali canes natura providè ſtipavit; qui durioribus cibis uti ſoliti, majori inteſtinalis fiſtulæ motu atq; calore, ad chylum elaborandum, fæceſq; (in his plerumq; duriores) eliminandas, indigere videntur. Etſi vèrò nobiliſſima Ars Chirurgica in brutis medendis haud occupata ſit, in eis tamen interdùm experiri, quod poſteà ad humani generis ſalutem atq; utilitatem trahat, minimè dedignatur: cùmq; inteſtina canis, portione abſciſſâ mutilata, coaleſcere iterùm atq; uniri videt; audentius inteſtinorum in homine, ſaltem craſſorum, vulnera conſuit, optatumq; inde majori cum fiduciâ ſucceſſum ſperat.

Explicatio Figuræ 5æ.

A a a. Inteſtini Ilei pars ſuperior ventriculum verſus.
B b b. Ejuſdem pars inferior.
C. Cicatrix vulneris Inteſtini ab interiori parte.
D D D. Inteſtini diviſi labia.
E. Orificium inteſtini ſuperius.
F. Orificium inferius.
e e e. Partes inteſtinorum adjacentium exteriores, portionis inteſtini hoc loco deficientis vicem ſupplentes.
f. Peritonæi pars inteſtino adnata.
G. Omentum inteſtino etiam connexum.
* * Inteſtini, quà cum altero coaleſcebat, ſeparati veſtigia.
H H. Aortæ Truncus.
I. Arteria Cœliaca.
g. Gaſtrica dextra.
h. Gaſtroepiploica dextra.
i. Hepaticæ.
k. Pylorica.
l. Gaſtrica major.
m m. Arteria Splenica.
K. Arteria Meſenterica ſuperior.
L. Phrenicæ.
O. Venæ Portæ Truncus.
P P. Arteriæ & Venæ per Meſenterium diſſeminatæ.

IV. *Part of a Letter from Mr* Antony van Leeuwenhoek, *F. R. S. concerning green Weeds growing in Water, and ſome* Animalcula *found about them.*

Delft *in* Holland, 25 Decemb. 1702.

I Have often heard the Common People ſay, that that Green Stuff or Weeds which are obſerved to drive upon the Water ſpring out of the Ground from under the Water.

I could by no means admit of this Aſſertion, for as often as I have obſerved the ſaid Green Weeds, I have always found that they are produced from the Seeds of the ſame kind, as all other Trees and Plants.

I have always obſerved too, that this Green matter does not grow in Deep Waters, tho they are ſmall and ſtill; and that wide and ſhallow Waters abound therewith, and eſpecially Motes and Ditches; and that the Wind does it no harm.

I have likewiſe found that the green Weeds in thoſe Ditches which have but little Water in them, are very ſmall in compariſon of thoſe in larger Waters, and near the ſides of the Banks where they are ſhallow, and very little motion in them.

Delfs-haven belongs to our Town and lies about 2 hours diſtance from it; from that Town, by means of a Sluce, the Water of the River *Maes* with the flood in Summer time, is brought into our Town; and it is as clear as if the River it ſelf run through the Town.

With this Water comes in alſo a little of this Green Stuff, but ſo little that we were half an hour a fiſhing up 30 of thoſe Weeds and putting them into an Earthen Pot, together with a large quantity of their own Water, for we took them up as deep as we could that we might not hurt their Roots.

I took out ſeveral of theſe Weeds from the Pot one by one with a Needle very nicely, and put them into a Glaſs Tube of a fingers breadth filled with Water, and alſo in a leſſer Tube, and cauſed the Roots of the Weeds to ſubſide leiſurely, and looking upon the ſame with my Microſcope, I was ſurpriz'd with the ſight of a great many and different kinds of *Animalcula*, of which two ſorts had long Tayls, whereby they ſeem'd faſt linkt to the Roots of thoſe Green Weeds. Theſe *Animalcula* were in ſhape like a Bell, and they ſo ſtirr'd the round Cavity of their Bodies, that they put the ſmall parts of the Water into ſuch a motion, that I could not ſee thoſe Inſtruments they uſed to produce the ſaid motion.

And, tho I ſaw 20 of theſe *Animalcula* together, gently moving their long Tayls and out-ſtretcht Bodies, they contracted their Bodies and Tayls in an inſtant, and then ſoftly extended them again; and this kind of motion they continued a great while, ſo that it was very diverting to obſerve them. I cauſed one of theſe *Animalcula* to be drawn, juſt as it appear'd faſten'd to the Roots of the aforeſaid Green Stuff.

Fig. 6. a, b, c, repreſents one of theſe Green Weeds of a common ſize, as it lay upon the Water, and appeared to the naked Eye of the Limner.

Fig. 7. d, e, f, g, ſhows you the very ſame Weed as it appear'd in the Glaſs Tube filled with Water, with the Roots thereof extended.

Fig. 8. h, i, k, l, m, n, o, p, q, r, repreſents a ſmall part of the ſaid Root, as it appear'd to the Painter in the Microſcrope, in which Roots were to be ſeen the Veſſels with their diviſions, thro the length of the whole Root; and theſe Roots, I imagin, were of no longer uſe, and in a manner wither'd; they were alſo overgrown with a great many particular long

Particles, and moſtly with little Figures like Flowers, as they are here repreſented in the 8th Fig. between k and l.

The *Animalcula* which I mentioned above, and liken'd to little Bells, are to be ſeen in the ſame Figure in i, s, t, and n, v, w; and I ſaw above a hundred of theſe *Animalcula* with their Tayls faſtn'd to the Root, and living between h, i, k, l, m, but other Roots had none of theſe.

In ſeveral of theſe Roots I obſerved one, and ſometimes, but ſeldom two ſheaths or caſes faſtned in them of ſeveral ſizes, the biggeſt is repreſented by r, x, y, Out of the ſame ſheath appear'd a little Creature, the fore-part of whoſe Body was roundiſh, as in x, z, y, and preſently from the ſame Rotundity proceeded 2 little Wheels that had a ſwift Gyration, as in Fig. 8. a, b, c. The Limner obſerving the Rotation of the Wheels, which always ran one and the ſame way, could not be ſatisfied with the ſight, adding, O, that he could always ſee ſuch a wonderful kind of a motion. Theſe ſmall Wheels were as thick beſet with Teeth, like the Wheel of a Watch; and when theſe *Animalcula* had for ſome time exerted their circular motion they drew their Wheels into their Body, and their Body wholly into their Sheaths, and then ſoon after thruſt them out again with the aforeſaid motion; another while they remain'd as it were ſhut up in their Shells, and tho I obſerved the ſame Wheels in other *Animalcula* alſo, yet their Bodies differed from each other, and the ſheaths were of a darkiſh colour, ſo that I could not eaſily perceive the *Animalcula*; and moreover, they ſeem'd to be compoſed of Globules.

I alſo obſerved other Sheaths that were ſeveral degrees ſmaller then thoſe before mentioned, and they were as tranſparent as Glaſs, ſo that one might plainly ſee the *Animalcula* lying within them.

Fig. 8. p. d, e, f, repreſents the Sheath with the little Worm, p, d, f, in it. The ſame Figure o, g, h, ſhows you a Sheath with half the Body of the ſame *Animalcula* g, h, protruded out of it, and in which, by reaſon of its exceeding ſmallneſs, one could ſee the Wheels but now and then, and that only when the ſaid Body was extended, which would ſoon be compreſt or ſhrunk up.

Moreover, I obſerved one of theſe *Animalcula*, whoſe Body was ſometimes long, and ſometimes contracted; and about the middle of its Body, which I conceiv'd to be the lower part of its Belly, there was another of the ſame kind, but ſmaller, the Tayl of which ſeem'd to be faſtned to the other. I cauſed one of theſe *Animalcula* (for the ſake of its wonderful Figure and Generation) to be drawn by my Limner, about twice as big as it appeared to the naked Eye, whilſt it was in the Water, and faſt linkt to the Root of the aforeſaid Green Weeds.

Fig. 9. a, b, c, d, e, f, g, ſhow you the *Animalculum* of which a is the Tail wherewith it faſtens itſelf; c, d, e, repreſents 8 Horns, whereas others that were ſmaller had but 6; 'tis drawn as ſtretcht out in its whole length, whereas when it contracted itſelf, it was not the 4th part ſo long. The Horns appeared of ſo wonderful a make to our Eyes, that it almoſt puzzled the Limner to draw them; however, he drew a ſmall part of one Horn, as in fig, 10. k, l, m.

In Fig. 9 you may ſee an *Animalculum* b, h, coming out of the Body of the bigger, which *Phenomenon* when I firſt perceived, I thought it might be a young Animalculum faſtned by chance to an old one; but obſerving it more narrowly, I ſaw it was a *Partus*, for I could now ſee, that whereas this *Animalculum* (when I firſt diſcovered it to be) had but 4 very ſmall Horns, after the ſpace of 16 hours was grown much bigger both in Horns and Body, and 4 hours after that it forſook its Mothers Belly.

In the diſcovery of the ſaid young *Animalculum*, I had obſerved on the other ſide of the Body of the biggeſt *Animalculum*, a round little knob of Seed that from time to time, and in a few hours grew ſtill bigger, as in Fig. 9. between g and i, and at laſt grew to be pointed, and in 13 or 14 hours was grown ſo large, that you might ſee 2 Horns upon it.

In the ſpace of 24 hours, the laſt mentioned *Animalculum* had acquired 4 Horns, one of which was ſmall, the ſecond bigger, and the 2 others very large, and theſe 2 laſt were more ſtrongly protruded and contracted than the others. Three hours after the little *Animalculum* was got clear of his Mother.

I endeavour'd to purſue my diſcovery of the Generation of theſe Creatures, and in order thereto wiped off the Green Weeds from the Body, that I might make my obſervations the better, but the *Animalculum* was not only dead, but his Horns and part of the Body was quite waſted.

Another *Animalculum* that had brought forth two young ones, had her Body laden with another ſort of little Creatures, whoſe ſhape was flat beneath and round above, and which I have obſerved in moſt Waters ; and this laſt ſort were above a thouſand times leſs than the others whom they crawl'd upon, and hinder'd to go ; but a much bigger *Animalculum*, whoſe body was almoſt round,tormented one of the aforeſaid Creatures, not only by running upon its Body, but by clinging ſo faſt to one of its Horns, that whatever effort t'other made to be rid of it, ſhe could not ſhake it off her Body, and at laſt I found ſhe had loſt one of her Horns in the ſcuffle.

That which ſeem'd very remarkable, and even wonderful to me, was that the ſaid *Animalcula* would ſometimes extend their Horns to ſo great a length, that looking on them thro the Microſcope, you would think they were ſeveral fathoms long. I caus'd the Limner to view the manner of the extenſion and contraction of the Horns, who was amaz'd as well as I to ſee the ſame.

I made him alſo deſign a ſmall part of the Horn ſo extended as well as he was able, as you may ſee in Fig. 11. n, o, p, wherein alſo are to be obſerved the knotty Protuberances, as as in Fig, 10. k, l, m. Theſe Protuberances ſeem to be compoſed of 7 round Globules placed together, *viz.* one in the middle, which was more prominent than the reſt, and the others like a Roſe round about it.

Now what a number of Veſſels and Inſtruments are to be found in ſuch a ſmall part of a Horn, as is repreſented in Fig. 11. and fill'd with Bows and Knots like a Rope that is twiſted; and perhaps every ſingle knotty Particle is provided with as many Inſtruments, wherewith to put it into motion.

This *Phænomenon* put me in mind of the knotted Threads, which has employed our Ladies ſo many years, and I ſaid with myſelf, if they were to ſee ſo perfect and wonderful a work of Nature, how would they bewail their loſs of time.

I obſerved in this Water, or rather in the Green Weeds, abundance of ſtrange *Animalcula*, ſome of which feed upon the ſame Green Stuff, and to others it ſerves inſtead of ſkulking holes to hide themſelves from the Fiſh, which would otherwiſe devour them.

To return to the Generation of the above-mentioned Green Weeds; I have ſeveral times obſerved, that moſt of the Roots are thickeſt at the end, and provided with a great many parts that look like Flowers to the Eye, with long Pipes in them, which I take to be a gummy excrementitious matter, which by overſpreading the whole Root, cauſes it to dye or wither. Now whether this is occaſioned by want of nouriſhment (the Weed being quite ſpent) or whether the ſame is brought by the Wind or Stream in deep Waters, remains to be conſider'd, as alſo how ſhallow thoſe Waters muſt be where this Green Weed can beſt grow.

I have often diſſected ſome of theſe ſmall Weeds, which had never yet produced any others, and have taken young Weeds out of them, which were ſo very ſmall that they eſcaped my naked Eye.

Let us ſuppoſe that fig. 6. a, b, c, which we call a Green Weed, is compos'd of three entire Weeds, of which that part markt A, we'll call the Mother Plant, from whence proceed ſeveral Roots; firſt the Plant B is immediately produced by the ſaid Mother-Plant, and joyn'd to it by a ſtring that as it grows conveys its nouriſhment to it, till it be provided with Roots of its own; before the Weed B is arrived to its full growth, A has brought forth another markt C, and that has no Root; now if we ſhould diſſect one of thoſe Weeds, even tho they were never ſo ſmall, we ſhall find young unborn Weeds within them.

I open'd one of theſe immature Weeds in the preſence of my Limner, and took out ſuch an Embryo as is before deſcrib'd, and placing it before my Microſcope I made him draw it immediately, before that the Moiſture of it ſhould exhale, for if that ſhould happen, the Veſſels through which it receives its Increaſe in Nouriſhment could not eaſily be deſcribed.

Fig. 12. repreſents a Weed which I had taken out of another of the bigneſs of c, in Fig. 6. this Weed received its nouriſhment by that part markt S, T. Between s, t, inwards you may obſerve five ſmall Particles, which I imagine to be alſo young Weeds; and that part too that lies between s, t, outward, is a young Weed as well as the reſt, tho one would hardly think ſo, as it is here repreſented, but that change of its figure happen'd by the exhalation of the Moiſture, for when I put it into the Limners hands it had as round and as entire a ſhape as this ſame Fig. 12. Q, R, S, T.

This being ſo, thoſe who aſſert that theſe Green Weeds ſpring from under the Earth, ought to be aſham'd of their Prejudices, ſeeing they do proceed from a Seminal Matter as well as other Plants.

That I might yet more fully ſatisfy my ſelf, I caus'd ſome of theſe Weeds to be taken out of a Ditch belonging to a Linnen Bleecher that was in diſuſe, becauſe no freſh Water could be brought into it. The Ditch was full of theſe Weeds, but the biggeſt of them were much ſmaller than the beforemention'd, but their Leaves much thicker.

Having examin'd theſe Weeds, I found, that altho they were arrived to their full growth, they had but two Roots which were longer than the Roots of the firſt Weed, and when I viewed the ſmaller Weeds, I could perceive they had a great many, but very ſhort Roots.

Whilſt I was obſerving the laſt Weed, I ſaw with wonder a great number of Animalcula ſwimming in Circles thro the Water, and ſo thick together, that even to the naked Eye they ſeem'd like a Cloud; I never ſaw any of theſe little Creatures in other Waters, and the next day they were all gone.

There was a great many ſorts of theſe Animalcula, and each had their different Motion, and all ſo ſmall as to eſcape our naked Eyes.

Among theſe, I obſerved ſome which were much bigger than the reſt, and were coupled together, in which action they lay very ſtill on the ſides of the Glaſs, but a bigger ſort interrupted them; whilſt they were quiet, I could eaſily ſee thoſe parts which they uſe in motion, and alſo the motion of ſeveral parts of their Body, which ſome would take for the Circulation of the Blood; but I rather eſteem it the Chile in the Guts. Theſe Animalcula were ſo big, that one might ſee them in clear Water and in a Glaſs Tube, amongſt ſeveral of theſe ſorts I could perceive ſome as big as little Sands, and as compleatly formed as our Garden Spiders.

V. *An account of Books.* I. *Aſtronomiæ Phyſicæ & Geometricæ Elementa. Auctore Davide Gregorio, M. D. Aſtronomiæ Profeſſore Saviliano & R. S. S. Oxoniæ,* 1702. *fol.*

WHat the World has hitherto wanted, the Learned Dr *Gregory*, has ſupplied it with a compleat Syſtem of true and Phyſical Aſtronomy; and as the laſt Ages have been ſufficiently furniſhed by the Ancients, with the Elements of Geometry, ſo without queſtion the future will have recourſe to this Book, for thoſe of Phyſical and Geometrical Aſtronomy.

The Phyſical explications are all built upon the principles of the great Mr *Newton*; and he has, throughout the whole Work, ſo mixed theſe with the Phænomena's themſelves, that they who are only ſollicitous about the Aſtronomical part, may underſtand it, as it is there delivered, without inquiring into the Phyſical cauſes. The Geometrical parts are either all proved from the citations of ſtandard Authors, or demonſtrated in *Lemma*'s, inſerted in their reſpective places. And that the Reader may not think Phyſical Inquiſitions in Aſtronomy to be only new, in his Preface he proves from *Diogenes Laertius*, *Plutarch*, *Stobeus*, *&c.* that the ancient Philoſophers, beſides their knowledge of the true Syſtem of the Univerſe, were not unacquainted with the real and Phyſical cauſes of the Planets Motions, and that univerſal Law of Nature from which they all ſpring, *viz.* that Matter attracts Matter in a reciprocal proportion of the ſquare of the diſtance.

In the firſt Book the Author treats of the Order, Motions and Periods of the Primary Planets, and the chief appearances that ariſe from thence, as their Directions, Stations, Retrogradations, *&c.* the different phaſes of the inferior, like to those of the Moon, the Ecclipſes of both Sun and Moon; and then he proves that the Primary Planets turn round the Sun; and that the direction of their gravity is not towards the Earth, but towards the Sun, and that it is by that force of gravity, that they are kept from going out in right lines, and made to turn round in Orbits; that this force of gravity decreaſes in each of them in the ſame proportion, that the ſquare of the diſtance from the Sun or Center encreaſes; as likewiſe, that all the Secundary Planets in turning round their Primary, are kept in their Orbits by the force of gravity, whoſe direction is towards the Centers of their reſpective Primaries, and that the accelerating force of this gravity, is in a reciprocal proportion of the ſquare of the diſtance; and that in the Moon it is the very ſame with the gravity of Bodies towards our Earth. Now, becauſe we know by obſervations, that the Planets move not in Circles, but in Ellipſes; in one of whoſe *foci* the Sun is placed, there muſt neceſſarily be a particular Law of gravity acting towards the Sun, to make the Planet move in ſuch Curves. This he inquires into, and finds it to be the very ſame with what he had before diſcovered, by comparing the diſtances of the Planets from the Sun with their Periodical Times.

Afterwards in the 7th Section, he proves, that this Law of attraction is univerſal of all Matter to Matter, and that it is the very ſame with Gravity; and that the Sun and Planets mutually gravitating towards one another, muſt neceſſarily turn round their common Center of Gravity, which by reaſon of the vaſt bigneſs of the Sun, in reſpect of the reſt, cannot be far from the Suns own Center. Now, ſince by this Law of attraction, the Moon muſt not only be drawn towards the Earth, but alſo towards the Sun; and that differently, according as its diſtance and poſition varies; he from thence, and the inclination of its Orbit to the plain of the Eckliptick, gives us the reaſon why the Nodes move backwards and upon the ſame account, their being as it were a redundant ring of Matter about the Earths Æquator, he ſhows how the Æquinoctial points muſt neceſſarily conſtanly go back a little, and make a proceſſion of the *Æquinox.*

Having thus ſettled the true cauſes of the Cœleſtial Motions, he next enquires into the various opinions of Philoſophers on that ſubject, and examines the *Phyſica Cœleſtis* of *Kepler*, the *Vortices* of *Carteſius*, and thoſe of the ingenious Monſieur *Leibnits*, whoſe ſeveral Theories he ſufficiently confutes; and then he gives an account of the other three celebrated Syſtems of the Univerſe, the *Ptolemaick*, *Tychonick* and *Semi-Tychonick*, and the different forces that are neceſſary to make the Planets move in the order, which thoſe Syſtems require.

In the 2d Book are explained all thoſe things that depend upon the motion of the *Primum Mobile*, the Doctrine of the Sphere, the Geneſis of the Circles, the uſe of the Globes, Spheres and other Inſtruments that are contrived to repreſent the Diurnal Motions of the Stars, together with the method of determining by obſervations the poſitions of the Circles in reſpect of each other, and the places of the Stars, their Longitudes, Latitudes, *&c.* the method of making Catalogues of the fixt Stars, with an Hiſtorical account of all thoſe Catalogues that have been hitherto made. Here alſo he ſhows the way of ſolving all the common problems of the Sphere by Trigonometry, as alſo the foundation and method of making all ſorts of Dyals by the ſame *Calculus*: And laſtly the various Ways of determining the Parallax and Refractions of the Stars with their demonſtrations.

In the 3d Book he deſcends more particularly to the Theory of the Primary Planets. And, becauſe each Planet ſo moves in an Ellipſe round the Sun, that it deſcribes Area's always proportional to the times, he gives the methods of dividing the Area of an Ellipſe by a Line drawn from its *focus* in a given proportion; which may be done either by the indirect method of *Kepler*, or directly by a Series of his own, which he demonſtrates; and then he ſhows Dr *Ward*'s Theory (wherein the Planets are ſuppoſed to deſcribe about the other *focus angles* always proportional to the times) to be only an approximation to the true one, wherein they deſcribe Area's at the other *focus* that are proportional to the times, and as ſuch it is expreſly mentioned by *Kepler* in his *Epitome Aſtronomiæ Copernicanæ*; but if the diſtance between the *foci* be great, this method will not give the exact place of the Planet, and therefore it wants the approximation of *Bullialdus*, which is only a nearer approach to truth Here alſo he conſiders the Oval Figure, in which Monſieur. *Caſſini* ſuppoſes the Planets to move; and he proves, that if a Planet moved in that Curve according to M. *Caſſini*'s Theory, it would deſcribe round the Sun equal Areas in equal times; and by conſequence a Centripetal force of a determined kind acting upon the Planet, might make it deſcribe this Curve; whereas Dr *Ward's* Theory is Phyſically impoſſible, there being no Centripetal force towards the Sun, that can make them move in an Ellipſe according to this Law; but then he tells us, that the Theory of *Caſſini* does not anſwer obſervations, nor will give the true Anomaly of the Planet, and its diſtance from the Sun. After this he comes particularly to ſhew the methods of determining the Orbits of the Earth and Planets, their Excentricities, poſition of their Apſides and Nodes, and deſcribes all the Tables that are neceſſary to calculate their motions, together with the manner of making them; and he alſo ſhews the way of finding out the Magnitudes, Denſities and Figures of the Sun and Planets, and the diſtances of the fixt Stars, where he takes notice, that the annual different diſtances of a fixt Star from the Pole (which Mr *Flamſteed* in his Letter to Dr *Wallis*, Printed in the third Tome of the Drs Works, ſays he has obſerved in the Polar Star) does not neceſſarily ariſe from their Parallax; but may proceed from other cauſes, ſo that from this obſervation, we cannot coſclude the parallax of the fixed Stars, nor does it directly prove the motion of the Earth, which Mr *Flamſteed* thinks he has done by it And it is the more likely, that this variation of the Stars diſtance from the Pole, obſerved by Mr *Flamſteed*, proceeds from ſome nutation, ſince the young

Mr *Caſſini* has demonſtrated, that in the Polar Star it cannot ariſe from the parallax of the *Magnus Orbis*; and our Author has given us good arguments to prove the fixt Stars to be at ſo great a diſtance, that the Diameter of the *Magnus Orbis* is inſenſible in reſpect of it.

Having thus eſtabliſhed the Theory of the Primary Planets, in the 4th Book he gives us that of the Secundary, whoſe motions are much more compoſed and intricate than any of the firſt, theirs being only compounded of an uniform progreſſive motion forward, and that of Gravity, by which, as it were they are drawn toward the Sun; whereas the Secundaries are not only attracted towards their reſpective Primaries; but alſo towards the Sun, and that with the ſame accelerating force of Gravity as the Primaries, when at the ſame diſtance, with a greater force when nearer, and a leſſer when further from the Sun, than the Primaries are. Which variety of the force of attraction, according to the various poſitions of the Secundaries Orbit, its inclination to the Orbit of its Primary, and the place of the Secundary in this Orbit, muſt neceſſarily produce various inequalities and irregularities in the motions of the Secundaries, all which he conſiders, at large, and from thence he explains the motions of the Apſides forwards, that of their Nodes backwards, the changeable inclination of the Orbits to the plains of their Primaries Orbits, the different velocities of the Secundaries, according as their poſition in reſpect of the Sun, and their Primaries vary; and he applys the whole to the motions of the Moon. All this, before the happy diſcoveries of that celebrated Philoſopher Mr *Newton*, was not to be attempted by any Phyſical explication, the greateſt advancement that was made, being only to ſolve them by an Aſtronomical Hypotheſis. He alſo gives us an account of the Tables neceſſary to calculate the Moons place ſeen out of the Earth, and the manner of uſing them; and to this he joyns Mr *Newton*'s own Theory of the Moon, which if uſed in practice, will determine her place nicely enough, even in the Quadratures, as has been found by comparing it with Mr *Flamſteed*'s obſervations, where when the error is greateſt it exceeds not two minutes, but for the moſt part it is ſo ſmall, that it may be juſtly enough imputed to the uncertainty of obſervations. After this he treats more particularly of the Eclipſes of both Sun and Moon, and the manner of Calculating them ; he gives an account of the Moons motion round its Axis, and ſhows how all thoſe various nutations and librations of the Moon, that has hitherto ſo much puzzled the Philoſophers, do only ariſe from its Menſtruous uniform rotations round its Axis ; from thence he paſſes to the ways of determining the magnitudes, denſities, and quantities of matter in the Secundary Planets, and the change of Figure both in the Primaries and them, that muſt neceſſarily ariſe if they are fluid from their mutual gravitation towards one another, from which he explains the Tydes and Motion of the Seas. He ends the Book with a deſcription of the Ring of *Saturn*, and accounts for all its various appearances ſeen out of the Earth.

In the 5th Book the Author treats of Comets, where after having given the ſeveral opinions of Philoſophers about their Place, Duration, Origine, Orbits and Tayls ; he tells us, that certainly they are Bodies that move round the Sun, and differ from the other Planets in that their Orbits are very oblong Ellipſes, whereas the Planets deſcribe Ellipſes which come very near to Circles, and from this Hypotheſis it is eaſy to give an account of the moſt of their *Phænomena* ; particularly he ſhows, that when a Comet comes down from its *Aphelion*, or when it aſcends to it, its Trajectory will ſeem to be a right Line, and may be aſſumed as ſuch, when its motions are to be determined without great niceneſs ; and upon this account, it is that *Kepler* and ſeveral others of the Aſtronomers did really ſuppoſe, that they went on ſtill in ſtreight Lines, without ever returning. Their Tayls he takes to be Vapours, which being heated by the Sun, ariſe copiouſly from their Bodies when they deſcend towards it, and are carried upwards by the Air in which they ſwim, where he takes notice, that if this matter of the Tail (which is ſpread at a great diſtance from the Comet itſelf) ſhould touch and mix with our Atmoſphere, may infect it with qualities pernicious to the temperament of our Vegetables and Animals; and from thence may ariſe all thoſe effects, which by long obſervations and common conſent of Mankind, have been attributed to Comets, notwithſtanding of their being ridiculed by ſome Modern Philoſophers. From this he paſſes to ſhow the method by which the Orbits of the Comets are to be determined. The ways he takes, are not only excellent in that caſe, but likewiſe of great uſe in ſolving other intricate and difficult Problems in Natural Philoſophy. And then he gives the way of finding both the Heliocentrick and Geocentrick places of a Comet for any given time, and deſcribes Tables that are neceſſary for the more ready performance of it.

The 6th and laſt Book is upon comparative Aſtronomy where he conſiders the *Phænomena* that would appear to a, Spectator placed in each of the Heavenly Bodies, and compares them with thoſe that are ſeen from the Earth. The chief of thoſe he takes notice of are their viciſſitude and duration of Days and Nights, the apparent Bigneſs, intenſneſs of Heat, and light of the Sun, the length of their Years, and variety of Seaſons, the phaſes of the Moon, and the Eclipſes of the Luminaries, the Number, Directions, Stations and Retrogradations of the Planets that are to be ſeen, and the helps they may afford to diſcover the true Syſtem of the Univerſe. After having given us an account of all theſe appearances in each of the Heavenly Bodies, he ſhows us that of all the *Primary* Planets, the Earth is the fitteſt place where an obſerver may diſcover the true Syſtem of the World, and *Mercury* the moſt unfit for that purpoſe; and that therefore an Inhabitant in any one of the Planets, may upon better reaſons ſuppoſe his own Habitation immoveable, and that the whole Heavens turn round about him; then theſe which our Terreſtrial obſervers have for their immobility, and having fewer arguments, it will be harder to convince them of their own motion. We may reaſonably then imagine, that an Aſtronome in any of the other Planets; as for example in *Venus*, would ſuppoſe his own Habitation immoveable, and would endeavour to make a Syſtem to ſatisfy all *Phænomena*'s upon that Scheme. This in his propoſition of the Aſtronomy in *Venus*, he ſays may be affected from the true Syſtem two ways: Firſt, if *Venus* were brought from its place in the true Syſtem down to the Center, and the Sun and the reſt of the Planets together with their Orbits, advanced as far the ſame way in parallel Lines, Such a Syſtem in *Venus* would be perfectly *Tychonick*, in which the Sun would be made turn round *Venus* in an Orbit equal, and like to that, in which *Venus* does really turn round the Sun, in the true Syſtem, and all the Planets, together with their Satellites, beſides their being carried round *Venus* by the Sun, would have all the ſame motions round the Sun, as in the true Syſtem. The Orbit of the Earth in this Syſtem, would cut the Sphere of the Sun after the ſame manner, as in the *Mars* interſects the Orbit of the Sun in the *Tychonick* Syſtem, which is framed for our Earth, whereas the Orbit *Jupiter* would not cut it, but ſurround it. The ſecond way, by whichd an Aſtronomer in *Venuus* may contrive a Syſtem to ſatisfy appearances, and make himelf unmntovable in the Center, is by bringing *Venus* to the Center, and advancing th Sun and all the Planets juſt as far in parallel Lines, as wa done before; but leaving their Orbits immoveable, and th very ſame which the Planets deſcribed round the Sun in th true Syſtem. If this were ſuppoſed by an Aſtronomer in *Venus* it would be the *Ptolemaick* Syſtem, in which the Sun is carried round *Venus*, placed in the Center of all the Planets Orbits, and ſuch of the Planets move in an Epicicle ſimular and equal, but in a contrary poſition to the true Orbit of *Venus* round the Sun, the Centers of the Epicicles being moved in their deferents in the ſame times that the Planets themſelves perform their revolutions in the true Syſtem And a *Ptolemaick* Syſtem made in this manner, would ſatisfy all the Cœleſtial *Phænomena's* equally as well as the *Tychonick* or the true Syſtem; ſo that if the *Ptolemaick* Syſtem for the Earth had been thus framed, there could have been no arguments from obſervations brought againſt it ; nor indeed any other way left to convince it of falſhood, but that only which is drawn from the principles of Natural Philoſophy.

II. *An Abſtract of Dr* Mead's *Mechanical Account of Poyſons ſent to the Publiſher, by* Sam. Morland.

THe firſt Eſſay with which the Dr preſents us, is concerning the *Viper* and its Poiſon. His Enquiries were the more neceſſary here, becauſe the Ancients, as he informs us, terrified both by Superſtition, and the danger of ſuch Experiments, have left the Anatomy of theſe Creatures very imperfect, and conſequently have reaſoned both looſely and precariouſly about the nature and effects of its Venome. *Charas*, *Rhedi* and Dr *Tyſon* have made great advances in this matter ; but 'tis upon a yet more accurate account of the Structure and Configuration of all thoſe parts that prepare, contain and diſcharge the deadly Juice that the Dr founds his enſuing reaſonings. (Which account you have with the neceſſary Figures, as drawn up by that Incomparable Anatomiſt and Learned Phyſician, Dr *Areskin* at the end of the firſt Eſſay.)

The Dr makes no ſcruple to aſſert, that the Viper conveys its miſchief by the yellow Liquor, which it emits into the Wound, thro a ſlit near the extremity of the Tooth. He hath here decided the controverſy ſo long agitated between Mr *Rhedi* and *Charas* in favour of the former, by ſeveral ſo convincing experiments, as that he hath left no room for future doubt or Cavil, making it even plain, that the *Sanies* itſelf conveyed into a Wound made by inciſions, and not by the Vipers Teeth, if it be infuſed in a ſufficient quantity will not fail to kill. Tho it may not have the operation, when inſerted by an hand too ſparing and timerous of ſucceſs.

That the Creature is furniſhed with ſo fatal a Juice, was deſigned for its own ſubſiſtence. Its food being ſuch as it could never digeſt unleſs it immediately killed its Prey. That it hurts any beſides, is only by accident, and when they meet it in its angry mood.

Upon the diſcharging this *Juice* into the Wound, there follow Pains, Swellings firſt red and then livid ; Faintings, Vomitings, cold Sweats, a change of colour in the Skin, like as in the Jaundice and finally Death, unleſs the ſtrength of the Patient, or ſeaſonable Medicines prevent.

To account for theſe *Symptoms*, the Dr thought neceſſary to examine the Texture of this Juice, which by viewing it thro an admirable Microſcope, he found to be full of little floating Salts, which in a ſhort time ſhot out themſelves into *Cryſtals* of an incredible tenuity and ſharpneſs, of which whole appearance he hath given a delineation in the Table. With this Juice he made ſeveral other experiments, upon the credit of which he blames thoſe that boldly, and without due enquiry affirm, that it is *Alkalious*, that ſo they may ſubject a new ſet of Maladies to the juriſdiction of their admired never failing *Acids*.

It was neceſſary not only to conſider this Juice, but the *Blood* alſo into which it is conveyed. And therefore the Dr gives us an account of the Doctrine of Fluids, the different coheſions and directions of their Particles upon Mr *Newton*'s Principles : Adding what is remarkable in the Blood, which is the Fluid under conſideration. Now this conſiſting of innumerable *Globule*'s floating in a Limpid *Serum*. The pointed Salts before-mentioned, are conjectured by the Dr to prick thoſe Globules or little Bladders. Whoſe hulls or caſes thus emptied of their Contents adhere, and are attracted in a manner quite different from what they were before, and ſo ſerve to break the Texture of the remaining Blood. Eſpecially, if we conſider, that the *Aura* theſe Veſiculæ emit may

ſerve

ſerve both to drive and convey the *Viperine Spicula* till they have diffuſed their ill effects over the whole Maſs. And thus I have given you an hint of the Drs reaſoning about this abſtruſe Matter. To which I ſhall only add, that the Dr omits not to acquaint his Reader, that he is of opinion, that theſe *Spicula* act upon the ſenſible Membranes in the nature of *Stimuli*, which he explains upon *Bellinis* Principles.

For the Cure he mentions a red hot Iron apply'd to the Wound, the Snake Stones, the *Axungia Viperina*, which he proves to be the grand Secret of the Viper Catchers; and the Vipers Fleſh of uſe the of which he gives a curious account out of the Ancient Phyſicians and Modern Travels.

In the cloſe of this Eſſay he gives an account of ſome other *Poyſonous* Animals; as the Spider, in which he hath diſcovered the Inſtrument conveying the Poyſon, which had eſcaped the nice diligence of Mr *Leewenhoek* himſelf; the *Scolopendra*; the *Scorpion*, of which I ſhall particularize nothing but that when it is reduced to a deſpair of Life, it wounds itſelf with its own Sting on the Back and dyes. And that the *Oleum Scorpionum* is a preſent Remedy for their Stings.

The next Eſſay is of the *Tarantula* and *Mad Dog*. The *Tarantula* is an *Apulian Spider* of the *Octonocular* kind, the Figure of which may be ſeen in *Baglivi*'s Diſſertation. To which there is one very like deſcribed by *Hernandez* by the name of *Hoitztocatl*. It harbours among the Corn, and there bites Mowers or Paſſengers. Upon which bite, eſpecially in Summer Time very odd Symptoms enſue, which require as odd a Cure. For among other effects, which ſavour of a *Delirium*, of which the Drs gives a particular enumeration, it is very obſervable, that when the *Tarantati* lye as ſometimes they do like Apoplectick Perſons, upon the ſound of an appropriate Tune they riſe up, and Dance till they ſweat out the Malady. Which yet returns tho in a weaker Degree, the ſame Seaſon the next year, and then again yields to the ſame method of Cure. Moſt of the Symptoms whic preceed the Apoplectick State, out of which the Muſick raiſes the perſon afflicted, having a tang of Madneſs, gives the Dr occaſion to preſent us with ſome curious and uncommon Thoughts about a *Delirium*; and to ſhow how theſe changes which are introduced into the Blood by the bite of the Spider, do diſpoſe the perſons to ſuch Actions, as denominate a Man in common Speech delirous. That his Account about theſe alterations in the Blood is true, appears plain, from what *Baglivi* obſerved in a Rabbit bitten by the *Tarantula*. But the moſt ingenious part of this Eſſay is that, wherein he ſhews, how Muſick may be ſuppoſed to contribute to the Relief of thoſe who are thus afflicted. As it works upon the mind, by preſenting to it lively *Species* of Joy and Mirth. As it affects the Body not only by exciting to thoſe motions that help them by Sweat and Evacuations, but as the harmonically Vibrating Air, by immediate contact affects the contractile Membranes with ſuch a determinate force, eſpecially thoſe of the Ear, and thereby of the Brain, which aſſiſts the contraction of the Fibrils, prevents a beginning Coagulation, *&c.* Upon which occaſion, we meet toward the end of this Eſſay with a moſt entertaining account of the ſeveral occaſions, upon which the Antients called in the aſſiſtance of Muſick for healing Diſtempers. This method being uſed by *Æſculapius*, *Theophraſtus*, *Cælius Aurelianus*, *Thales* of *Crete*; as the Dr proves from *Galen*, *Pindar*, *Athenæus*, *Aulus Gellius* and *Plutarch*. Where there are two remarks too particular to be omitted, one is, that this practice is called *Decantare loca Dolentia*, which is a lucky atteſtation to one part of the Dr's foregoing reaſoning. The other, is, that *Pythagoras* himſelf, who reſided in this part of *Italy* may not improbably be ſuppoſed to have introduced this method in this Caſe.

The Symptoms from the bite of a mad Dog are no leſs odd, but much more terrifying. Of theſe Symptoms the Dr hath given us an account, as they have been obſerved by *Galen*, *Dioſcorides*, *Ætius*, *Ægineta* and *Cælius Aurelia-*

nus; as alſo from Dr *Liſter* and Dr *Howman*. As for the moſt of theſe Symptoms which the Dr with the generality of Authors attributes to a *Delirium*; He accounts for them by the alteration made in the Blood by the *Saliva* of the Dog, whoſe Madneſs he ſaith, is the effect of an high Feaver. This incorporated with the Arterial Fluid raiſes an efferveſcence in the Blood Veſſels, eſpecially in the Brain, from whence proceed ſuch diſorders, as may eaſily be ſuppoſed to induce a *Delirium* according to the account of this affection given in the former part of the Eſſays. As to the *Hydrophobia*, the Dr hath advanced a notion, which, however particular it may ſeem, will I dare ſay, become general in a ſhort time. For he ſuppoſes this to be no part of the *Delirium*, but to ariſe from the Pain they feel in ſwallowing Liquor, which Pain is excited, partly by its touching the inflamed Membranes of the *Fauces*, partly becauſe the Liquor fermenting with the active Particles diſcharged upon the Stomachick Glands twitches and irritates the Membranes. A like inſtance, to which we have in Colical Caſes. But nothing can go farther towards deciding the Caſe, than to know, as he affirms, that upon whatever occaſion the Glands become thus inflamed the *Hydrophobia* follows, tho there be no Bite in the caſe. Which he proves from *Sckenckius*, *Salmuth*, &c. and obſervations from diſſections.

For the Cure he recommends beſides enlarging the Wound, Scarrifying, or at leaſt pouing in melted *Unguentum Ægyptiacum*, all that abſorbs a Peccant Humour, or carries it off by Urine. Several Medicines to this purpoſe he mentions, and among the reſt *Lichen Cinereus Terreſtris*, whoſe Efficacy depends upon the aforeſaid properties. But above all ſubmerging, of which he givesa brief Hiſtory, and a Philoſophical account of its operation and ſucceſs.

Eſſay the 3d, is of Mineral and Vegetative Poyſons. *Sublimate* is compounded of *Mercury* and *Common Salt*, which when ſublimed, prove one of the moſt deadly Poyſons, tho each compounding Ingredient be perfectly innocent. Of the latter there is no doubt, the innocency of the former he proves by ſeveral inſtances, and the Nature of its operations as a Medicine, in which he declares himſelf to agree with the Learned Author of the new Theory of Fevers, to whom he refers for a farther account of this matter. The compoſition becomes deſtructive, as he moſt ingeniouſly informs us, in that the Globules of Mercury which riſe in Fume, lodge themſelves in the Pores, and Inſterſtices of the Saline Cryſtals. Now theſe being like ſo many ſharp Blades wound more forcibly by the addition of this weight of the Mercurial Globules, and more conſtantly and irreſiſtably, becauſe the Inſterſtices, at which the Stomachick Juices would otherwiſe enter and diſſolve theſe wounding Salts, are already poſſeſſed by the Particles of Mercury. This account will be the more acceptable to thoſe that read on, till they ſee how in purſuance of the ſame principles the Doctor explains (what ſeems hitherto to have been in vain attempted) the deſtruction of this corroſive Quality by a ſecond Sublimation.

Next he fetches the Nature of *Arſenick* out of the darkneſs and obſcurity, in which it hath lain till now. And here after an accurate Enumeration of the ſeveral kinds both Native and Factitious, having examined upon Chymical Principles its Compoſition, he accounts for its operation much after the ſame manner, as for *Sublimate Corroſive*: There being here alſo cutting Salts and a *Regulus* to give them weight and force. Only it is to be obſerved, that the *Sulphur* diſcoverable in *Arſenick* both by ſmell and its inflammability, ſerve as an additional *Vinculum* to the wounding *Spicula*, and by its heat to inflame the Wounds which they have made. He concludes this Eſſay with wonder at a dangerous cuſtom that hath prevailed among ſome to wear a bag of this Corroſive Mineral at the pit of the Stomach, as an Amulet againſt the Plague. Into which he moſt probably conjectures men were lead, by ſome ignorant Writers who falſly Tranſlated *Darſeni* (which ſignifies Cinnamon, and is recommended by *Arabian*

bian Authors as a preſervative) by *Arſenick*, which in *Arabick* is called *Zarnick*.

As for Plants as *Cicuta, Aconitum, OEnanthe Cicutæ facie ſucco Viroſo, &c.* he imputes their deadly effects to their Corroſive parts, which rarifying the Juices of the Stomach, and wounding it Nervous Membrane by an eaſy and intelligible proceſs, induce all thoſe diſorders which at laſt end in death. For beginning their Havock in the Stomach, they draw all parts by degrees into a communication of Pains and Agony.

Here he makes it plain how Mineral and Vegetative Poyſons tho of the ſame kind, work ſo differently from their different force. And how, tho Mineral Poyſons ſeldom paſs the *Primæ Viâ*, yet Vegetables often do. This Eſſay concludes with an ingenious conjecture at the compoſitions of thoſe Poyſons, by which the *Africans* and *Indians* are reported to be able to kill at long diſtances of time, and ſome directions about the Cure.

Eſſay 4. *Opium* he tells us comes under the Head of Narcotic Poyſons, tho a noble Remedy exhibited in a proper quantity. To aſſiſt our conceptions about the Nature of this, he explains the Nature of *Sleep* at large, of which I ſhall only rehearſe thus much, that as it concerns the Body, it conſiſts in an eaſy, and a ſort of Æquilibrious diſpoſition of the Fluids, and Muſcular parts. As to the Mind, in a ceſſation of ſuch thoughts as we exerciſe when awake, upon which we reflect, and will to employ our Minds.

After this and a Chymical Analyſis of *Opium* itſelf, he aſcribes its efficacy to a *Volatile, Alcaline Salt* intimately mixt with a Sulphurous ſubſtance, which he proves at large to act upon the Stomach and the Arterial Fluid itſelf, and diſpoſe in ſuch a manner as it is diſpoſed when we Sleep. He ſhows further how by the ſame Mechaniſm this Drug eaſeth Pains, checks Evacuations, cauſes difficulty of Breathing; but above all, how in too great a quantity it commenceth Poyſon by rarifying the Blood, and enflaming the Stomach to ſuch a degree, that the Veſſels can no more recover their tone, which he found to be exactly the caſe in a Dog, upon which he made the Experiment. For the Cure he recommends Acid Medicines and Lixivial Salts. Generous Wines (the Antients Remedy) help only by diſſolving the clammy Reſinous parts.

The laſt Eſſay is of *Venomous Steems* and *Damps*, in *Latin* called *Mephites*, from a Syriac Theme ſignifying to breath. Of this ſort the *Mephitis* of *Hierapolis*, and the *Specus Coricius* were famous of old. They are frequent in Countries that abound with Minerals or Subterraneous Fires. The moſt celebrated of all, is the *Grotta de Cani* near *Naples* in *Italy*, which the Dr hath viſited, and given an accurate deſcription of it. The Fumes which here ariſe but to a determinate height and then turn downwards, and fall back to the Earth, being drawn into the Lungs, both expell the Air out of the *Veſiculæ* and poſſeſſing its room, ſtreighten the paſſage of the Blood Veſſels. How this comes to be ſo deſtructive will appear to them, who ſhall attentively read the Theory of Reſpiration here inſerted, and founded upon Mechanical Principles. He proceeds from hence to treat of Peſtilential Fevers, what conſtitution or temperament of Air inclines to them, how the Symptoms appear in their firſt Riſe, Progreſs and Height, concluding with ſome cautions about *Waters*, which as they are ſometimes ſaturated with Metalline, Lapideous or Saline Particles, produce ill conſequences in the Bodies of Men, different according to the ſtrength of the Tinctures, or the particular nature of the Particles, or the part of the Body wherein they are depoſited.

That the Reader may have a juſt Idea of this performance, I think it neceſſary to add to what hath been ſaid in the extract. That the curious Antient and Polite Learning, with which it is well ſtored, is the ſmalleſt part of its recommendation. And 'tis not doubted, but the Publick when they have pleaſed and benefitted themſelves by peruſing theſe Eſſays, will agree with me, that their Learned Author was modeſt, when he ſaid that it was not difficult to ſay ſomething on theſe Heads, more tolerable than Authors had before ſaid.

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BErn. Ramazzini in Patav. Archi Lycæo Prof. Publ. de Morbis Artificum Diatriba, accedunt Lucæ Ant.Port j in Hippocratis librum de Veteri Medicina paraphraſis, nec non ejuſdem diſſertatio Logica, in Octavo Ultrajecti 1703.

Geo Baglivi Med. Rom &c. Specimen quatuor, Librorum de Fibra Motrice & Morboſa, in quibus de ſolidorum Structura, Vi, Elatere, Æquilibrio, Uſu, Poteſtate, & Morbis diſſeritur, nec non de Duræ Matris Conſtructione, & in ſingula quæque ſolida Oſcillatione ſyſtaltica, & obiter de Experimentis, ac Morbis ſalivæ, Bilis & Sanguinis de Statice Aeris, & Liquidorum per Obſervationes barometricas, & hydroſtaticas ad uſum Reſpirationis explicatæ, de Circulatione Sanguinis in Teſtudine, ejuſdemq; Cordis Anatome, in Octavo Ultrajecti. 1703.

——— Ejuſdem praxis Medica in Octavo, ibid.

Caſp. Bartholini Specimen Hiſtoriæ Anatomicæ partium Corporis Humani ad Recentiorum mentem accommodatæ, Noviſq; Obſervationibus illuſtratæ, cum figuris Amſt. 1701.

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THere having been lately Propoſed by Subſcription Mr *RAY*'s third and laſt Vol. of his *HISTORY* of *PLANTS*, whereby that whole Work is compleated containing more Plants, and Deſcription of new *Species*, than all the Books yet extant on that ſubject; many hundreds being communicated from the Streights of *Magellan*, the *Philippine Iſlands*, and ſeveral Countries never ſearched of Plants before. By *F. Georgio Camelli* and other *Virtuoſi*, who either reſide, or have made careful remarks in the reſpective places; all diſpoſed in an eaſy method, to be found by their Tribes and Characteriſticks; with an account of ſuch parts of them as are either Specificks for ſome Diſeaſes, as the *Peruvian Bark*, *&c.* or are Univerſal Medicines, as *Faba St Ignatii*, *&c.* beſide many peculiarities belonging to particular Plants, every where occurring in the Work. The ſame is already well advanced at the Preſs, as may be ſeen by the Sheets printed off at the Undertakers *SAM. SMITH* and *BENJ. WALFORD*, Printers to the Royal Society, at the *Prince's Arms* in St *Paul's* Church-yard. Of whom Propoſals may be had, and Printed Receipts given for the firſt payment.

BRITISH MUSEUM NATURAL HISTORY.

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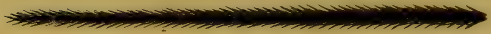
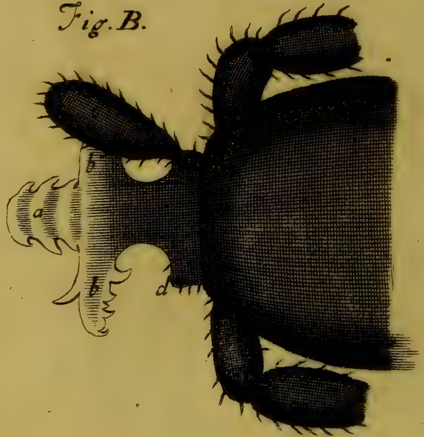


Fig. B.



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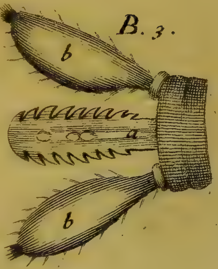

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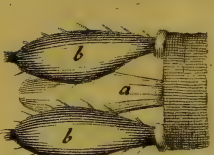

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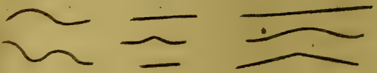

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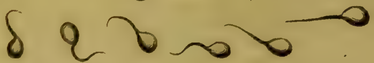

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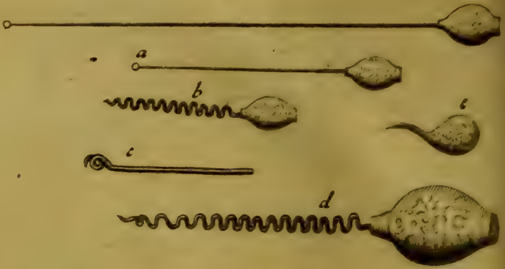

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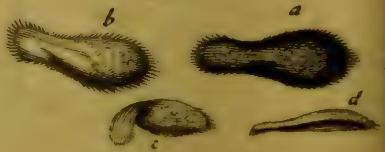

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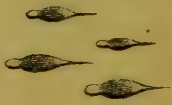


Fig. G.

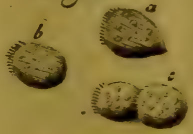


Fig. L.

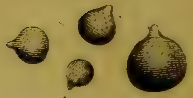


Fig. K.

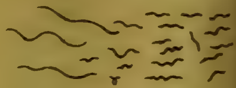


Fig. M.

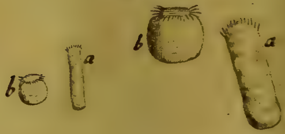
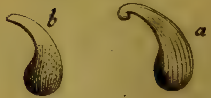


Fig. N.



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PHILOSOPHICAL TRANSACTIONS.

For the Months of March *and* April, 1703.

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V. *An Account of a Book.*

Hippocratis Aphoriſmi, cum Commentariolo. Auctore Martino Liſter, *e Medicis Sereniſſiæ Majeſtatis Reginæ* Annæ. Londini *Typis* W. B. *Impenſis* A. & J. Churchil, *ad Inſigne Nigri Cygni, vico vulgo dicto* Parer-noſter row, 1703.

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There having been lately Propoſed by Subſcription Mr *RAY*'s third and laſt Vol. of his *HISTORY* of *PLANTS*, whereby that whole Work is compleated containing more Plants, and Deſcription of new *Species*, than all the Books yet extant on that ſubject; many hundreds being communicated from the Streights of *Magellan*, the *Philippine Iſlands*, and ſeveral Countries never ſearched of Plants before. By *F. Gorgio Camelli* and other *Virtuoſi*, who either reſide, or hav made careful remarks in the reſpective places; all diſpoſed in an eaſy method, to be found by their Tribes and Characteriſticks; with an account of ſuch parts of them as are either Specificks for ſome Diſeaſes, as the *Peruvian Bark &c.* or are Univerſal Medicines, as *Faba St Ignatij*, *&c.* beſide many peculiarities belonging to particular Plants, every where occuring in the Work. The ſame is already well advanced at the Preſs, as may be ſeen by the Sheets Printed off at the Undertakers *SAM. SMITH* and *BENJ. WALFOD*, Printers to the Royal Society, at the *Prince's Arms* in St *Paul*'s Church-yard. Of whom Propoſals may be had, and Printed Receipts given for the firſt payment.

I. *Part of a Letter from the Reverend Mr* Abraham de la Pryme *F. R. S. to the Publiſher, concerning a Spout lately obſerved by him in* Hatfield.

Thorn. June the 26th.

TIs ſometime ago that I ſent you an account of a Spout, that my ſelf and many others ſaw in *Hatfield* Pariſh in 1685, with ſome few conjectures upon the Cauſe of it. Since that time I have been ſo happy as to ſee another in the ſame place, which very much confirms me in my notion of the Origin and Nature of them. The Weather here in this part of the Country, hath been exceeding wet and cool, inſomuch that it ſeem'd rather to be Spring than Midſummer, yet for all that *Monday* the 21ſt ditto was pretty warm, on the afternoon of which day, about 2 of the Clock, no Wind ſtirring below, tho' it was ſomewhat great in the Air, the Clouds begun to be mightily agitated and driven together; whereupon they became very black and were (moſt viſibly) hurried round, from whence proceeded a moſt audible whirling noiſe, like that commonly heard in a Mill. After a while a long Tube or Spout came down from the Center of the congregated Clouds, in which was a ſwift ſpiral motion like that of a Screw, or the *Gochlea Archimedis* when it is in motion, by which Spiral Nature and ſwift turning, Water aſcends upin to the one as well as into the other. It travelled ſlowly from Weſt to North Eaſt, broke down a great Oak-tree or two, frighted the Weeders out of the Field, and made others lie down flat upon their Bellies, to ſave being whirl'd about and killed by it, as they ſaw many Jackdaws to be that were ſuddenly catched up, carried out of ſight, and then caſt a great way of amongſt the Corn ; at laſt it paſs'd over the Town of *Hatfield*, to the great terrour of the Inhabitants, filling the whole Air with the Thatch that it pluck'd off from ſome of the Houſes ; then touching upon a corner of the Church, it tore up ſeveral Sheets of Lead, and roll'd them ſtrangely together, ſoon after which, it diſſolved and vaniſhed without doing any further Miſchief.

There was nothing more extraordinary in this, than in the other that I gave you a former account of, and by all the obſervations that I could make of both of them, I found that had they been at Sea, and joyn'd to the ſurface thereof, they would have carried a vaſt quantity of Water up into the Clouds, and the Tubes would then have become much more ſtrong and opake than they were, and have continued much longer.

It is commonly ſaid that at Sea the Water collects and bubbles up a foot or two high under theſe Spouts before that they be joyned : But the miſtake lies in the pellucidity and fineneſs of thoſe Pipes, which do moſt certainly touch the ſurface of the Sea before that any conſiderable motion be made in it, and that when the Pipe begins to fill with Water it then becomes opake and viſible.

As for the reaſon of their diſſolving of themſelves after that they have drunk up a great quantity of Water, I take it to be by and through the great quantity of the Water that they have carried up, which muſt needs thicken the Clouds, and impeade their motion, and by that means diſſolve the Pipes.

II. *De Curvarum Tangentibus è Maximorum ac Minimorum Theoriâ immediatè deductis: Unâ cùm Theorem: quibuſdam ad Sectiones conicas pertinentibus, ejuſdem calculi auxilio inveſtigatis. Autore* Humphrido Dittono.

TAngentium methodum propono, facilem ſatis ac generalem, imò generaliſſimam, ut pote curvis omnibus unâ eâdemque opera inſervientem. Neque novam vocare metuo, cùm celebriorum Geometrarum nullus (in quantum unquam ſcire potui) aliquid hujus generis publici juris fecit. Pauca tantum ejus ſpecimina hîc in medium profero, nire enim tum clarâ ac apertâ exemplorum multitudine non indigetimus!

Sit Curva A G H, cujus vertex A, axis A K, ordinatim applicata F D centrumque (ſiquod habet) punctum K. Sumpto puncto L in Axe ſit $AL=n$, $AD=x$, $FD=y$, $FL=z$; quarum quantitatum, tres poſteriores ſunt fluentes, prior verò *n* permanens ac ſtabilis, hæc enim una eademque prioribus variis ſemper reſpondet. Ex Triangulo Rectangulo F D L, hanc habemus Equationem, $zz=yy+nn-2nx+xx$; determinandoque z ad extremum, oritur $2y\dot{y}-2n\dot{x}+2x\dot{x}=0$; unde interpretando $2y\dot{y}$ ſecundum propriam Curvæ naturam, relinquetur quantitas *n* expoſita in terminis etiam Curvæ propriis.

Cùm verò z hoc modò ad valorem extremum determinatam habeamus; hoc eſt, linea F L omnium quæ *a* puncto L ad Curvam duci poſſunt vel maxima vel minima ſit, indeque ad Curvam in puncto F normalis; ipſam D L eſſe ſubnormalem patet, ex quâ ſubtangens nullo negotio eruitur.

In exemplum producatur primò Parabola Apolloniana, quàm curvam hîc delineatam eſſe ſupponemus. Habemus ergo $2y\dot{y} = r\dot{x}$ (poſito Parametro $= r$) unde $r\dot{x} - 2n\dot{x} + 2x\dot{x} = 0$, & $n = \frac{r}{2} + x$, ergoque DL ſubnormalis $= \frac{1}{2}r$. (Cujus Theorematis ſenſus hîc eſt, viz. Si ultra terminum D abſciſſæ A D, deſignetur D L ſemiparametro equalis, atque à puncto L producatur L F recta ad punctum F; recta ſic ducta Parabolæ in puncto F normalis erit, & omnium quæ à puncto L, ad Curvam duci poſſunt minima. Dico minimam; alicui enim curvæ naturam ac indolem ſcienti, apparet Maximam eſſe non poſſe (idquod in ſequentibus notatum velim) ſed neceſſario eſt vel maxima vel minima, ideoque poſterior.) Hæcque pars prior eſt Theor. 5. Lib. 7. Conicor. Præclariſſimi de La Hire.

Ducatur ordinata E B, junganturque puncta E, L; ſit intercepta $BD = f$, unde $AB = x - f$, & $BL = \frac{r}{2} + f$. Jam $LE^q = \frac{rr}{4} + rx + ff$, & $FL^q = \frac{rr}{4} + rx + ff$, & $FL^q = \frac{rr}{4} + rx$, ergo $LE^q - FL^q = BD^q$; quæ pars poſterior eſt Theorem. 5. ejuſdem Lib. Conicor.

Quò propriùs punctum F in quò curvam normalis ſecat, puncto A ſive vertici admovetur; eò propiùs etiam punctum L eidem venit. Ergo quando F cùm A coin-

A coincidit, & ſic evaneſcit ordinata F D, tunc ipſa Minima jacet in Axe A K, & ſemiparametri quantitatem adequabit. Hoc eſt in illo caſu $n = \frac{1}{2} r$ tantum; in nihilum abeunte x abſciſſâ ad ordinatam evaneſcentem pertinenta. Si ergo $AL = n = \frac{1}{2} r$, ſumpto puncto D inter A & L, fiat $AD = x$; tum oritur

$$FL^q = \frac{rr}{4} + xx, \text{ ergo } FL^q - AL = xx,$$

hoc eſt $FL^q - AL^q = AD^q$ ſemper. Ejuſdemque tenoris eſt Theor. 2. Lib. 7. Conicor. de La Hire.

Secundò ſit curva quædam ordinis Parabolici ſuperiors, cujus æqnatio $r^{p-q} x^q = y^p$.

Tum $yy = r^{\frac{2p-2q}{p}} x^{\frac{2q}{p}}$, adeoque

$2y\dot{y} = \frac{2q}{p} r^{\frac{2p-2q}{p}} x^{\frac{2q-p}{p}} \dot{x}$; ſubſtituendoque hunc valorem loco $2y\dot{y}$ in æquatione generali determinante z ad tremum, habemus inde $n = \frac{q}{p} r^{\frac{2p-2q}{p}} x^{\frac{2q-p}{p}} + x$; & propterea ſubnormalis $DL = \frac{q}{p} r^{\frac{2p-2q}{p}} x^{\frac{2q-p}{p}}$;

Hoc verò ſingulis hiſcè curvis facillimè applicatur, ſi indices p & q ſecundum unius cujuſque naturam ac genium debito modo exponantur.

Supponetur tertiò Curvam eſſe Ellipſiu cujus ½ Axis Mador A K; ex cujus etiam equatione conſequitur $2y\dot{y} = r\dot{x} - \frac{2rx\dot{x}}{q}$. Unde provenit

$$r\dot{x} - \frac{2rx\dot{x}}{q} - 2n\dot{x} + 2x\dot{x} = 0,$$ &

$n = \frac{r}{2} + x - \frac{rx}{q}$, ac propterea $\frac{r}{2} - \frac{rx}{q}$ ſubnormali D L equalis. Sivero ellipſeos loco ſubſtitueretur Circulus, equationem eodem modo tractando, inveniemus $DL = r - x$, poſito *r* Circuli Radio æquali.

Sed ad Ellipſiu revertendum, cujus alia proprietas ex hoc fonte deducenda eſt, prout in Parabolâ factum. Sit $BD = f$, unde $AB = x - f$. Habemus LE^q ($= LB^q + EB^q$) $= \frac{rr}{4} - \frac{rrx}{q} + \frac{rrxx}{qq} + ff + rx - \frac{rxx}{q} - \frac{rff}{q}$: & FL^q ($= FD^q + LD^q$) $= rx - \frac{rxx}{q} + \frac{rr}{4} - \frac{rrx}{q} + \frac{rrxx}{qq}$: Ergo, $LE^q - LF^q = ff - \frac{rff}{q}$;
Hoc verò eſt Theor. 6. Lib. 7. Conic. de La Hire.

Poſtulat enim Geometra ille ſublimis, ut ſit q. r. $\frac{q}{2} - x$ :: L D, cujus valor eſt $\frac{r}{2} - \frac{rx}{q}$ prout ſupra inventum;

ventum; ideoque quarta proportionalis eſt tribus aute poſitis: Hoc verò ei conceſſo, L F eſſe minimam omnium rectarum quæ à puncto L ad Ellipſiu duci poſſunt evidenter demonſtrat. Preterea quoniam eſt $q : q - r :: f : f : f - \frac{fr}{q}$, Ergo $\square\, ff - \frac{rff}{q}$ ſive $f \times f - \frac{fr}{q}$, idem eſt quòd rectangulum apud D. De La Hire exemplar vocatum: Hoc verò exemplar ſecundum ejus definitionem, eſt Rectangulum ſimile Rectangulo, differentiam inter Quadratum Axis Tranſverſi & Figuram conſtituenti (hoc eſt Rectangulo $qq - qr$) & preterea ad Rectam B D ſive f applicatum. Et quòd Rectangulum $ff - \frac{rff}{q}$ omnes haſcæ conditiones poſſideat, luce Meridianâ Clarius eſt.

Notetur, ex valore quantitatis n ſupra invento, planè conſequi $n > \frac{r}{2}$. Nam $n = \frac{r}{2} + x + \frac{rx}{q}$, ergo $qn + rx = \frac{qr}{2} + qx$, ſed (propter $q > r$) $qx > rx$, ergo, $qn > \frac{qr}{2}$, & $n > \frac{r}{2}$.

Quando (ut in Parabola modò obſervatum) punctum F in A verticem incidit, ipſa Minima in Axe deſignatur; & propter evaneſcentem x, habemus $n = \frac{r}{2}$: Aſſumptoque quovis puucto D inter A & L, ſi A D = alicui x, comparando emergit $FL^q - AL^q = xx - \frac{rxx}{q}$; quòd ipſum eſt Theor. 3. Lib. 7. Conic.

D. La Hire. Quoniam enim eſt $q : q - r :: x : x - \frac{rx}{q}$, patet $\square\ xx - \frac{rxx}{q}$ eſſe exemplar, ſed applicatum ad abſciſſam x; & preterea hoc eſſe menſuram adequatam defectûs, quadrati Minimæ à quadrato cujusvis rectæ alterius, ab eodem puncto ad curvam protenſæ; hæcque demonſtrat ille loco citato.

Theoremata verò ad Axem minorem ſive conjugatum ellipſeos ſpectantia (hactenus enim majore ſive Transverſo uſi fuimus) eodem planè modo determinantur. Sit jam A K ½ Axis Minoris $= \frac{c}{2}$, Parameter $= R$; punctum L jam ultra centrum, ad alteras partes G K collocari ſupponitur. Operando ut priùs, invenietur A L ſive $n = \frac{R}{2} + x - \frac{Rx}{c}$, & ſubnormalis $DL = \frac{R}{2} - \frac{Rx}{c}$; Hoc eſt $c : R :: \frac{c}{2} - x : \frac{R}{2} - \frac{Rx}{c}$, adeoque ducta F L omnium quæ à puncto L ad ellipſin duci poſſunt Maxima; & $LF^q - LE^q = \frac{Rff}{c} - ff =$ Rectangulo exemplar ad B D (ſive f) applicato. Quòd verò hoc ſit exemplar, patet, eſt enim $c : R - c :: f : \frac{Rf}{c} - f$, adeoque ex definitione, $\frac{Rf}{c} - f \times f =$ Exemplari. Hoc verò Theor. eſt 7 Lib. 7 Conicor. De La Hire.

Iterum; Puncto F cùm A coincidente; propter evaneſcentem x evaneſcentis tunc temporis ordinatæ, relinquitur $n = \frac{R}{2}$, & A L omnium quæ à puncto L ad Ellipſin duci poſſunt Maxima, & $AL^q - FL^q = \frac{Rxx}{c} - xx$ = Exemplari ad A D ſive x applicato; eodemque modo ſonat. Theor. 4. Lib. predicti Conicorum.

Obſervandum verò ad caſum precedentem (quòd priùs ergo notari debuit) ubi invenimus $n = \frac{R}{2} + x - \frac{Rx}{c}$, quòd $n > \frac{R}{2}$; nam $cn + Rx = \frac{Rc}{2} + cx$, & propter $R < c$, adeoque $Rx < cx$, relinquitur $cn > \frac{Rc}{2}$, & $n > \frac{R}{2}$.

Jam verò ut res in Ellipſi peracta eſt, ſic eodem prorſus modo in Hyperbola peragenda foret, Minimæque in hâc curvâ lineæ determinandæ: ſed talis inter haſcæ curvas connectio, tam faciliſque ab unâ ad alteram tranſitus, ut vel Tyronibus ipſis labor inanis videatur. Nil aliud reſtat, v. gr. ad ſubnormalem determinandam, quàm ut ſignum $-$ in $+$ mutetur. Nam cùm in Hyperbolâ ſit $2yy = rx + \frac{2rxx}{q}$, & $n = \frac{r}{2} + x + \frac{rx}{q}$ (exquatione generali) manet $DL = \frac{r}{2} + \frac{rx}{q}$.

Concipietur Quarto Curvam M S N (in altera Fig. Fig. parte delin. Eſſe unam ex Hyperboloidibus, cujus Aſymptoti A K, K H, rectamque S R ad Aſymptoton K H ordinatam, S R ſit = y, S P = z, K R = x, K P = n, quæ hîc neceſſariò minor erit quàm x, ut conſideranti patet. Equatio curvæ propria eſt $y^p x^q = r^q s^p$ cujus loco (propte r & s quantitates determinatas) ſcribi poſſit $y^p = x^{-q}$, adeoque $y^2 = x^{\frac{-2q}{p}}$, & $2\dot{y}y = -\frac{2q}{p}\dot{x}\,x^{\frac{-2q-p}{p}}$; hinc cum $zz = yy + xx - 2nx + nn$, pro extremo habemus $2\dot{y}y + 2\dot{x}x - 2n\dot{x} = 0$, hoc eſt $-\frac{2q}{p}\dot{x}\,x^{\frac{-2q-p}{p}} + 2\dot{x}x = 2n\dot{x}$, & $n = x - \frac{q}{p}x^{\frac{-2q-p}{p}}$ adeoque ſubnormalis P R $(= x - n) = \frac{q}{p}x^{\frac{-2q-p}{p}}$

Curvam jam A F G (ultimo loco) Cycloiden primariam concipiamus; ſitque *r* Radius, *c* Arcus & *y* ordinata Circuli genitoris, cujus Diameter per A K repreſentatur centrumque inter L & K poſitum. Tum vocatâ F D cycloidis ordinatâ *a*, cæteriſque ut priùs; curvæ equatio eſt $aa = yy + 2cy + cc$, adeoque $zz\ (= aa + nn - 2nx + xx) = yy + 2cy + cc + nn - 2nx + xx$, & (*z* ad extremum determinatâ)

natâ) $2y\dot{y} + 2c\dot{y} + 2y\dot{c} + 2c\dot{c} - 2n\dot{x} + 2x\dot{x} = 0$.

Eſt verò $\dot{y} = \frac{r\dot{x} - x\dot{x}}{y}$, & $\dot{c} = \frac{r\dot{x}}{y}$, ergo hos valores ſubſtituendo, ac equationem debitè reducendo, habemus $2r - + \frac{2rc - 2xc}{y} + 2r + \frac{2cr}{y} = 2n - 2x$; ac propterea $2r - x + \frac{2rc - xc}{y} = n - x = DL$ ſubnormali.

Incomparabilis D. Barovius ſubtangente præcognitâ, ad Maximum & Minimum determinandum utitur; hocque idem poſt eum fecit D. Neiwentiit in ſuâ infinitorum Analyſi. Cùm verò multis aliis Methodis, in quibus nihil omnino de Curvarum Tactione preſupponitur, Maximum ac Minimum inveniri queant, palàm eſt è Maximis & Minimis ad Tangentes determinandas, tutò ac legittimè procedere poſſe.

COROLL. I.

Exempla hactenus oblata percurrenti, in ſingulis vis patebit, quòd $2y\dot{y} - 2n\dot{x} + 2x\dot{x} = 0$, poſito nempè loco n in hâc equatione, valore ejus ſecundùm curvæ naturam, In Hyperboloidibus ergo

$$\frac{2q+p}{p} \qquad\qquad \frac{2q-p}{p}$$

ex.gr. $\frac{2q}{p}xx - 2xx + \frac{2q}{p}xx + 2xx = 0$, quòd (ipſo oculo judice) manifeſtum eſt; & ſic in aliis (ſine ullâ demonſtratione) veritas facilè perſpicietur.

COROLL. II.

Ex ſubnormalium inventione, curvarum ordinatas Maximas & Minimas facile determinabimus. Hâcque in re dico, ſi ſubnormalis (pro aliquo curvæ puncto) nihilo ponatur equalis, habemus ordinatam iſtius curvæ ad extremum determinatam; & quidam maximam ſi ad partes curvæ concavas, minimam verò ſi ad convex applicari intelligatur. Ex. gr. in Circulo (poſitâ ſubnormali $= l$) eſt $l = r - x$; ſit $r - x = 0$; ergo $r = x$, ac nide $y = r$, hoc eſt applicata maxima Radio equalis. Similiter in Ellipſi, $l = \frac{r}{2} - \frac{rx}{q}$; ſit

$\frac{r}{2} - \frac{rx}{q} = 0$, tum $rq = 2rx$, ac $x = \frac{q}{2}$; ergo $yy = \frac{rq}{4}$

$=$ 4tæ parti Figuræ (ut vocant) ſive ſemiaxis conjugati quadrato, adeque maxima $y =$ iſti ſemaxi. Nec Methodo diſſimili cùm aliis curvis operandum foret; inveniatur ſubnormalis ex equatione datâ, eâque nihilo equali poſitâ, ordinatam curvæ maximam vel minimam determinatam habebimus; priorem ad partem curvæ verſus axem concavam, poſteriorem ad convexam.

POSTSCRIPTUM

Prioribus ſequentia hæc (notatu non indigna) adjungi poſſunt.

PRimò æquè facilè hâc methodo determinari Tangentem, ad partes curvæ convexas operando, ac ad partes concavas uti priùs. Sit enim A C Tangens verticalis inque eâ ad libitum ſumpto puncto C, ſit $AC = n$, $CO = z$ (quò etiam charactere omnes lineæ, à puncto C ad curvam convexam A E G ductæ, inſigniantur) ergo ductâ M O ſemper ad A C perpendiculari, erit $CM = n - y$, & cùm $OM = x$, erit $zz = nn - 2ny + yy - xx$, adeoque (pro extremo ipſius z valore) $2y\dot{y} + 2x\dot{x} - 2n\dot{y} = 0$. In quâ equatione ſi exponatur $2x\dot{x}$ ſecundum curvæ naturam, lineam C Z (quæ hoc loco ſubnormalis vicem ſubibit) determinatam dabimus. Res clarior eſt quàm quæ exemplis Illuſtrantibus indigeat; quæque jamjam dicta ſunt facile hoc opus excuſabunt.

Secundò, Sicut Methodo priore, (Curvarum Tangentes invenimus) ipſus lineas L E vel C O à puncto dato vel in Axe vel in Tangente verticali ſumpto productas, ad extremum determinando; ſic etiam conſiderando lineas Q E, &c. à puncto in Axe dato ultra verticem productas, idem (idque Univerſaliter) perficere poſſumus. Omnes enim lineæ Q E valoris fluentis ſunt ac perpetuò mutabilis, ſola verò Tangens Q F (poſito quòd Q F curvam tangat) ſtabilis eſt ac ad unicum valorem determinata. Hoc ergo loco, τȣ extremi Hypotheſi non innitemur, ſed quantitatem permanentem tantum ſpeculabimur. Aſſumantur duo puncta Q L, indeque ad idem curvæ punctum E duæ ſemper lineæ ducantur L E, Q E. Inter punctum F contactus ac verticem, angulus Q E L ſemper erit obtuſus, ad alteras verò partes puncti F acutus erit, ſuppoſito (quòd priùs monitum) Q F curvam tangere, ac F L ei ad angulos rectos inſiſtere. Sit Q A = p. A L = n. A B = x. B E = y. Q E = z. V E (intercepta inter punctum E & V ubi cadit Q V perpendicularis ab Q in L E productam) = v. Jam propter Triangulum obtuſangulum Q E habemus hanc equationem

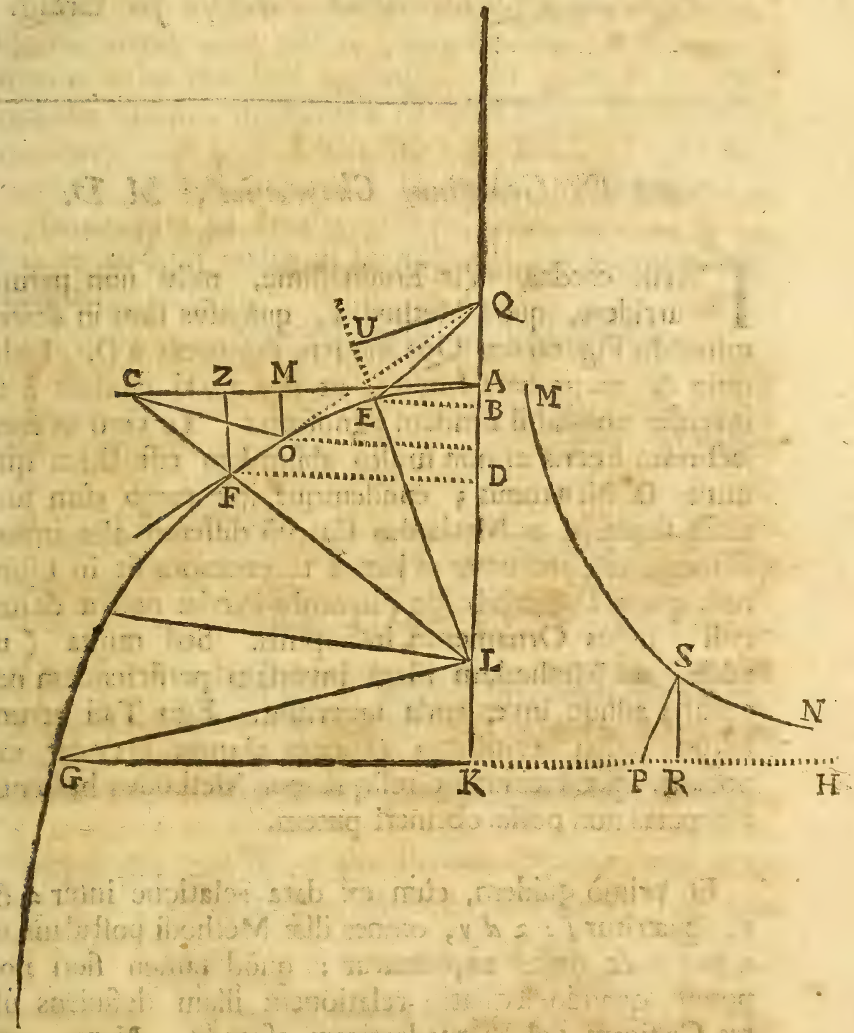
$$zz = p^2 + 2pn - y^2 - x^2 + \overline{y^2 + n^2 - 2nx + xx}|^{\frac{1}{2}}$$

$\times 2v$; ſive loci $\overline{y^2 + n^2 - 2nx + xx}|^{\frac{1}{2}}$ ſcribendo f, eſt $zz = p^2 + 2pn - y^2 - x^2 + 2nx - 2fy$, ideoque

$$2z\dot{z} = 2y\dot{y} - 2x\dot{x} + 2n\dot{x} - 2f\dot{v} - 2v\dot{f}.$$

Si z jam fit quantitas ſtabilis, quò in Caſu Q E cùm Q F tangente coincidet, erit tum

$-2y\dot{y} - 2x\dot{x} + 2n\dot{x} = 0$ (rectangulo 2 f v ejuſque adeo fluxione penitus evaneſcente.) Hæc verò eſt ipſa equatio Generalis Methodo ſuperiori determinata, quæque uti-videmus non minus facilè ac naturaliter ex hoc ſuppoſito quantitatis ſtabilis principio, quàm ex illo extremi deducitur.



III. *Specimen Methodi Generalis determinandi Figurarum Quadraturas. Antore* Jo. Craig.

Ad D. Georgium Cheynæum, M. D.

FAcile credas, Vîr Eruditiſſime, mihi non parum arridere, quòd Methodus, quâ uſus ſum in determinandis Figurarum Quadraturis, tantopere à D. Leibnitio & te probata fuerit; ut ille alteri cuidam à ſe inventæ non-nihil ſimilem agnoſceret. Tu verò ut conjecturam feceris ei non multo abſimilem eſſe illam quâ utitur D. Newtonus; eundemque ipſe tanto cùm ſucceſſu ſequaris, ut Methodus Calculi differentialis inverſa incredibili incremento jam à te promota ſit in Libro tuo, quem D. Archibaldo Pitcarnio Patriæ noſtræ & ſæculi, hujus Ornamento inſcripſiſti. Sed multa (ut nôſti) ad Methodum illam inverſam perficiendam neceſſaria adhuc invenienda ſuperſunt. Ego Tibi rerum harum judici peritiſſimo rationes aliquot breviter exponam, quæ faciunt ut reliqua per Methodus hactenus uſurpatas non poſſe obtineri putem.

Et primò quidem, cùm ex data relatione inter z & y, quæritur $\int: z\,dy$, omnes illæ Methodi poſtulant ut z per y & datas exprimatur; quòd tamen fieri non poteſt, quando æquatio relationem illam definiens ultra Cubicam vel Bi-quadraticam aſcendit. Nam, non ſine magno hujus ſcientiæ opprobrio, hæret hîc adhuc Algebra Vulgaris. Secundo, quamvis regula innoteſceret generalis inveniendi Radices æquationum cujuſcunque gradûs; huic tamen Methodo inverſæ prorſus foret inutilis: Radix enim è ſurdis tam complicatis involveretur, ut nullâ arte (hactenus cognitâ) à differentiali ad Integralem regreſſus dari poſſet. Ob has rationes, Vir clariſſimè, aliàs vias & (favente Deo) conatu non prorſus irrito rem ſum aggreſſus. Et quia in his me quædam tibi non diſplicitura inveniſſe ſpero, ideo eorum Specimen Tibi publicè impertiri conſtitui. Precor interim ut Deus Otium tibi & vitam, ut Geometriam ac Medicinam ad talem perducas perfectionem, qualem in utrâque editæ à Te Primitiæ meritò expectare faciunt.

Amicum Tibi devinctiſſimum,

Gillingham,
22 Apr. 1703.

Jo. Craig.

SECTIO I.

SIT $z^m + a y^n = b z^e y^r$ æquatio exprimens relationem inter Ordinatam z & abciſſam y; in quâ Exponentes m, n, e, r, denotant quoſlibet Numeros, Integros vel Fractos, Affirmativos vel Negativos. Ponatur $r - n = c$ Erit

$$\text{AREA} = \frac{m}{m+n} zy +$$

$$\frac{mc + ne}{m \times \overline{m+n} \times \overline{c+1+n} \times \overline{m+n} \times \overline{e+1}} + \frac{b}{a} z^{e+1} y^{c+1} +$$

m+e

$$\frac{\overline{m-e}\times\overline{c+1}+r\times\overline{e+1}}{m\times\overline{2c+1}+n\times\overline{2e+1}}+\frac{bB}{a}z^{2e+1}y^{2c+1}+$$

$$\frac{\overline{m-e}\times\overline{2c+1}+r\times\overline{2e+1}}{m\times\overline{3c+1}+n\times\overline{3e+1}}+\frac{bC}{a}z^{3e+1}y^{3c+1}+$$

$$\frac{\overline{m-e}\times\overline{3c+1}+r\times\overline{3e+1}}{m\times\overline{4c+1}+n\times\overline{4e+1}}+\frac{bD}{a}z^{4e+1}y^{4c+1}+$$

$$\frac{\overline{m-e}\times\overline{4c+1}+r\times\overline{4e+1}}{m\times\overline{5c+1}+n\times\overline{5e+1}}+\frac{bE}{a}z^{5e+1}y^{5c+1}+\&c.$$

De hâc Seris hæc ſunt notanda : (1.) Quòd literæ majuſculæ B, C, D, &c. deſignent coefficientes terminorum ipſis immediatè præcedentium : (2.) Quòd exhibeat Quadraturas omnium Figurarum Quadrabilium, quarum Curvæ per æquationem trium terminorum definiuntur : (3.) Et quòd ſemper ſint Quadrabiles, quando $\frac{m \times 1 - r}{mn - rm - en}$ eſt numerus integer & affirmativus, quem vocemus l. (4.) Speciatim $l+1$ dat numerum Terminorum (ab initio ſumptorum) Seriei Aream quæſitam conſtituentium : (5.) Quòd ſi ponatur $e = 0$, mutabitur hæc Series in Celebre Theorema Newtonianum pro Binomio communi; & proinde hoc Theorema eſt hujus Seriei caſus ſpecialis & ſimplex: (6.) Cùm ſit Applicatio hujus Seriei ad Figuram particularem, hæ regulæ ſunt obſervandæ. 1ª. Reducatur æquatio Curvam datam definiens ad formam generalem, & ex comparatione particularis cùm generali invenientur coefficientes a, b; ut & exponentes m, n, e, r. Secunda, Si exponentes ſic determinati non faciant l numerum integrum & affirmativum, (juxta conditionem in Not. 3. aſſignatam,) tum alius terminus æquationis particularis à quantitate z liberetur; & ſi nunc exponentibus denuo determinatis non competat illa Quadrabilitatis conditio, tum reliquus terminus à quantitate z liberetur: Nam nullo labore quilibet ex tribus terminis æquationem datam conſtituentibus à quantitate z liberari poteſt. Tertia, Si æquationi per Regulam præcedentem tractatæ non conveniat prædicta Quadrabilitatis conditio; tum per Seriem quæratur Areæ complementum $ſ\colon y\,dz$: quo cognito ſtatim habetur Area quæſita; nam, ut omnibus notum, $zy - ſ\colon y\,dz = ſ\colon z\,dy$. Et ut ſine confuſione Complementum per Seriem obtineatur; in æquatione data Curvam particularem definiente pro z ſcribatur Y, & pro y ſcribatur Z: Factâque hâc mutatione Ordinatæ in Abſciſſam, & Abſciſſæ in Ordinatam, tractetur æquatio juxta præcepta regulæ ſecundæ; donec illi conveniat Quadrabilitatis conditio, vel eandem ipſi non poſſe convenire pateat.

Exemplem 1. Sit $z^3 + y^3 = bzy$. Quia hîc $m = 3$, $n = 3$, $e = 1$, $r = 1$, $a = 1$; ideo $l = 1$, adeoque $l + 1 = 2$. Et proinde (juxta Not. 4.) duo primi Serei termini dant Aream $= \frac{1}{3} z y - \frac{1}{6} b z^2 y^{-1}$.

Exemp. 2. Sit $z^7 + ay^3 = bzy^2$, ubi $m = 7$, $n = 3$, $e = 1$, $r = 2$; qui faciunt $l = 2$; ideo (juxta Not. 4.) tres primi Seriei termini dabunt quæſitam

$$\text{AREAM} = \frac{7}{10} zy - \frac{b}{15a} z^2 - \frac{2b^2}{15a^2} z^3 y^{-1}.$$

Exemp. 3. Sit $z^3 + ky^5 = hz^{-2} y^{11}$; ubi $m = 1$, $n = 5$, $e = 2$, $r = 11$; at quia hi non faciunt l numerum integrum & affirmativum; ideo (per Regulam ſecundam) libero terminum $hz^{-2} y^{11}$ à quantitate z; & ſic æquatio fit $z^5 - hy^{11} = -kz^2 y^5$; ubi $a = -h$, $b = -k$; & $m = 5$, $n = 11$, $e = 2$, $r = e$; qui faciunt $l = 1$: Unde

$$\text{AREA} = \frac{5}{16} zy - \frac{k}{16h} z^3 y^{-5}$$

Exemp. 4. Sit $z^2 - hy^2 = -kz^2 y^2$; ubi $m = 2$, $n = 2$, $e = 2$, $r = 2$; qui non faciunt l numerum integrum & affirmativum; ideo libero terminum $-kz^2 y^2$ à quantitate z; & tum $z^0 + ky^2 = hz^{-2} y^2$; ubi $a = k$, $b = h$; & $m = 0$, $n = 2$, $e = -2$, $r = 2$, qui faciunt $l = 1$, ideo

$$\text{AREA} = \frac{h}{k} z^{-1} y$$

Exemp. 5. Sit $z^2 - \frac{4g^2}{h} y^6 = -\frac{g}{h} z^2 y^4$; ubi $m = 2$, $n = 6$, $e = 2$, $r = 4$; qui non faciunt l numerum integrum & affirmativum; idemque contingit liberato (à quantitate z) utrolibet ex reliquis: Ideo juxta regulam Tertiam quæro Complementum; quare (ut jam præmonui) pono $z = Y$; $y = Z$; unde æquatio data erit

$$Y^2 - \frac{4g^2}{h} Z^6 = -\frac{g}{h} Z^4 Y^2;$$

quæ (juxta Reg. 1.) reducta ad formam generalem erit hujus modi $Z^6 - \frac{h}{4g^2} Y^2 = \frac{1}{4g} Z^4 Y^2$ ubi $m = 6$, $n = 2, e = 4, r = 2$; qui non faciunt l numerum integrum & affirmativum; ideo (juxta Reg. 2.) libero terminum ultimum a Z; unde $Z^2 - \frac{1}{4g} Y^2 = \frac{h}{4g^2} Z^{-4} Y^2$; ubi $m = 2$, $n = 2$, $e = -4$, $r = 2$; unde $l = 1$; & $a = -\frac{1}{4g}$, $b = \frac{h}{4g^2}$; Unde Areæ quæſitæ complementum eſt

$$= \tfrac{1}{2} ZY - \frac{h}{2g} Z^{-3} Y \text{ ſeu } \tfrac{1}{2} zy - \frac{h}{2g} zy^{-3};$$

Ergo etiam Area quæſita $ſ: z\,dy = \tfrac{1}{2} zy + \frac{h}{2g} zy^{-3}$.

SECTIO II.

Sit $z^m + ay^n = bz^{2e} y^{2c+n} + fz^e y^{c+n}$ æquatio exprimens Relationem inter Ordinatam z & Abſciſſam y. Erit

$$\text{AREA} = Azy + Bz^{e+1} y^{c+1} + Cz^{2e+1} y^{2c+1} + Dz^{3e+1} y^{3c+1} + Ez^{4e+1} y^{4c+1} + Fz^{5e+1} y^{5c+1}, \ \&c.$$

Ubi (poſitis $2c+n=r$, $c+n=s$) $A=\frac{n}{m+n}$;

$$B=\frac{\overline{m-e+s}\times A+e-m}{m\times\overline{c+1}+n\times\overline{e+1}}\times\frac{f}{a}$$

$$C=\frac{\overline{m-2e+r}\times bA+\overline{\overline{m-e}\times\overline{c+1}+r\times\overline{e+1}}\times fB+2eb-mb}{ma\times\overline{2c+1}+na\times\overline{2e+1}}$$

$$D=\frac{\overline{\overline{m-2e}\times\overline{c+1}+r\times\overline{e+1}}\times bB+\overline{\overline{m-e}\times\overline{2c+1}+s\times\overline{2e+1}}\times fC}{ma\times\overline{3c+1}+na\times\overline{3e+1}}$$

$$E=\frac{\overline{\overline{m-2e}\times\overline{2c+1}+r\times\overline{2e+1}}\times hC+\overline{\overline{m-e}\times\overline{3c+1}+s\times\overline{3e+1}}\times fD}{ma\times\overline{4c+1}+na\times\overline{4e+1}}$$

$$F=\frac{\overline{\overline{m-2e}\times\overline{3c+1}+r\times\overline{3e+1}}\times bD+\overline{\overline{m-e}\times\overline{4c+1}+s\times\overline{4e+1}}\times fF}{ma\times\overline{5c+1}+na\times\overline{5e+1}}$$

De hac Serie (cujus progreſſio primo ferè intuitu eſt manifeſta) hæc ſunt notanda. (1.) Quod figuræ (quarum Curvæ prædictâ æquatione definiuntur) ſunt Quadrabiles, quando Numeri exponentiales m, n, e, c; & coefficientes a, b, f habent relationes modo aſſignandas; ſcil: quando $\frac{\overline{2c+m}\times\overline{n-2e}}{-cm-en}$ eſt numerus integer & affirmativus, quem vocemus l. & (cum l eſt major quam 2) quando Coefficientium relatio eſt hæc.

$$\frac{\overline{m-2e}\times\overline{lc-c+1}+r\times\overline{le-e+1}}{\overline{e-m}\times\overline{lc+1}-s\times\overline{le+1}}\times\frac{bU}{f}=$$

$$\frac{\overline{m-2e}\times\overline{lc-2c+1}+r\times\overline{le-2e+1}}{m\times\overline{lc+1}+n\times\overline{le+1}}\times\frac{bP}{a}+$$

$$\frac{\overline{m-e}\times\overline{lc-c+1}+r\times\overline{le-e+1}}{m\times\overline{lc+1}+n\times\overline{le+1}}\times\frac{fU}{a}$$

Ubi U & P denotant Coefficientes Terminorum duorum, qui immediate præcedunt ultimo Areæ quæſitæ Termino; ſcil: U eſt coefficiens termini ad Ultimum propioris, P coefficiens termini ab ultimo remotoris: ut ſi $Fz^{5e+1}y^{5c+1}$ eſſet ultimus Areæ quæſitæ terminus, tum U denotaret E, & P denotaret D. (2.) Ultimus ille Areæ quæſitæ terminus ex valore numeri l cognoſcitur; nam hic etiam $l+1$ dat numerum terminorum (ab initio ſumptorum) Seriei, qui Aream quæſitam conſtituunt. (3) Si fuerit $l=1$, tum coefficientium relatio debet eſſe hæc

$$\frac{\overline{2e-m}\times\overline{1-A}+rA}{\overline{e-m}\times\overline{c+1}-s\times\overline{e+1}}\times\frac{b}{f}=\frac{\overline{e-m}\times\overline{1-A}+sA}{m\times\overline{c+1}+n\times\overline{e+1}}\times\frac{f}{a};$$

Si $l=2$; relatio debet eſſe hæc

$$\frac{\overline{m-2e}\times\overline{c+1}+r\times\overline{e+1}}{\overline{e-m}\times\overline{2c+1}-s\times\overline{2e+1}}\times\frac{bB}{f}=$$

$$\frac{\overline{2e-m}\times\overline{1-A}+rA}{m\times\overline{2c+1}+n\times\overline{2e+1}}\times\frac{b}{a}+$$

$$\frac{\overline{m-e}\times\overline{c+1}+s\times\overline{e+1}}{m\times\overline{2c+1}+n\times\overline{2e+1}}\times\frac{fB}{a}.$$

SECTIO

SECTIO III.

SIT $z^{m} = ay^{n} + bz^{e}y^{c+n} + fz^{2e}y^{2c+n} + gz^{3e}y^{3c+n} + hz^{4e}y^{4c+n} +$ &c. æquatio exprimens relationem inter ordinatam z & abſciſſam y; & conſtans terminis quotcunq; Erit.

$$\text{Area} = Azy + Bz^{e+1}y^{c+1} + Cz^{2e+1}y^{2c+1} + Dz^{3e+1}y^{3c+1} + Ez^{4e+1}y^{4c+1} + \&c.$$

Quod in fallor, eſt Theorema non contemnendum. Calculo per-facili inveniuntur A, B, C, D, E, &c. ut & Quadrabilitatis conditiones, & quot termini ſeriei Aream quæſitam conſtituant. Creſcit quidem numerus harum conditionum pro multitudine terminorum, ex quibus conſtat æquatio relationem inter z & y definiens. Et ſpeciatim ſi illa terminorum multitudo vocetur N; tum N—2 eſt numerus conditionum Quadrabilitatis; quarum una Exponentium m, n, e, c relationem reſpicit, eſtq; hæc; ut

$$\frac{Nc - 2c + 2e - Ne + m + n}{-cm - en},$$

eſt numerus (quem vocemus l) Integer & affirmativus. Reliquæ vero conditiones coefficientium a, b, f, g, h, *&c.* reſpiciunt. Ac deniq; l+1 dat numerum terminorum (ab initio ſumptorum) ſeriei, qui Aream quæſitam conſtituunt.

Corol. Ex hac Serie generali deduci poteſt Series, quæ exhibeat Quadraturas Figurarum, quarum Curvæ definiuntur per æquationem conſtantem terminis quibusvis, qui æquationem Sectionis tertiæ generalem conſtituunt. Nam ad hanc obtinendam opus tantum eſt Seriem computare pro æquatione conſtante tot terminis (ab initio ſumptis) æquationis generalis, quot includent Terminos æquatio Curvas definiens. Tum ex valoribus quantitatum A, B, C, D, *&c.* Eliminentur illæ coefficientes b, f, g, *&c.* quæ ad æquationem propoſitam non ſpectant; reliquæ dabunt aream quæſitam Exemplo res datebit.

SECTIO IV.

SIT $z^{m} = ay^{n} + bz^{e}y^{c+n} + gz^{3e}y^{3c+n}$. Equationem exprimens relationem inter Z & Y. Jam quia

$$z^{m} = ay^{n} + bz^{e}y^{c+n} + fz^{2e}y^{2c+n} + gz^{3e}y^{3c+n}$$

eſt illa pars pars æquationis quæ (ſumptis terminis in ordine a principio) includit æquationem datam; quam deinceps (brevitatis cauſa) æquationem completam vocabo; ideo Figurarum (quarum Curvæ definiuntur per æquationem completam.)

Areæ

$$\text{Areæ} = Azy + Bz^{e+1}y^{c+1} + Cz^{2e+1}y^{2c+1} + Dz^{3e+1}y^{3c+1} + Ez^{4e+1}y^{4c+1} + Fz^{5e+1}y^{5c+1} + \&c.$$

& a, b, f, g ingredientur valores quantitatum B, C, D, E, F &c. Si ergo in his valoribus ponatur ubiq; $f=0$ (quia $fz^{2e}y^{2c+n}$ æquationem datam non ingreditur) habebis valores quantitatum A, B, C, D, E, &c. qui in Serie ſubſtituti dabunt Areas quæſitas. Et Calculo inito in veni.

$$A = \frac{m}{m+n}. \qquad B = \frac{\overline{e-m-c-n}\times A+\overline{m-e}}{m\times\overline{c+1}+n\times\overline{e+1}}\times\frac{b}{a}$$

$$C = \frac{\overline{c+n}\times\overline{e+1}+\overline{m-e}\times\overline{c+1}}{m\times\overline{2c+1}+n\times\overline{2e+1}}\times\frac{bB}{a}$$

$$D = \frac{\overline{\overline{m-3e}\times\overline{1-A}+\overline{3c+n}\times\overline{-A}\times g}}{ma\times\overline{3c+1}} \; \frac{\overline{+\overline{m-e}\times\overline{2c+1}+\overline{c+n}\times\overline{2e+1}\times -bC}}{+na\times\overline{3e+1}}$$

B b b b b b b b

E=

$$E = \frac{\overline{\overline{m-3e}\times\overline{c+1}+\overline{3c+n}\times\overline{e+1}}\times\overline{-gB+\overline{m-e}\times\overline{3c+1}+\overline{c+n}\times\overline{3e+1}\times-bD}}{ma\times\overline{4c+1}+na\times\overline{4e+1}}$$

$$F = \frac{\overline{\overline{m-3e}\times\overline{2c+1}+\overline{3c+n}\times\overline{2e+1}}+\overline{-gC+\overline{m-e}\times\overline{4c+1}+\overline{c+n}\times\overline{4e+1}\times-bE}}{+ma\times\overline{5c+1}+na\times\overline{5e+1}}$$

$$G = \frac{\overline{\overline{m-3e}\times\overline{3c+1}3+\overline{c+n}\times\overline{3e+1}}\times\overline{-gD+\overline{m-e}\times\overline{5c+1}+\overline{c+n}\times\overline{5e+1}\times-bF}}{+ma\times\overline{6c+1}+na\times\overline{6e+1}}$$

Ex his patet progreſſio reliquorum in infinitum. Et ſic habetur Series exhibens Quadraturas omnium Figurarum, quarum Curvæ definiuntur per hanc æquationem quatuor terminorum $z^m = ay^n + bz^e y^{c+n} + gz^{3e} y^{3c+n}$.

Et notandum quod conditiones Quadrabilitatis & numerus terminorum Seriei, Aream quamlibet quæ ſitam conſtituentium, eadem ſunt cum conditionibus Quadrabilitatis, & numero Terminorum, quæ conveniunt Figuris, quarum Curvæ per æquationes completas definiuntur.

Corol. Præter has duas ſeries in § 2 & 4 propter Figuras quatuor terminorum, poſſunt eodem modo infinitæ aliæ ſeries computari pro cæteris caſibus Figurarum, quatuor terminorum. Quod etiam intelligendum eſt De omnibus aliis Figuris, quarum Curvæ per æquationes quotlibet terminorum numero conſtantes definiuntur.

Non jam vacat ipſam Methodum minutiatim deſcribere, per quam ad hujuſmodi Series pervenio; brevem tamen ejus rationem exponere forte non ingratum erit. Aſſumo Seriem ex z pariter ac y compoſitam, ſc: $Azy + Bz^p y^q + Cz^s y^h + Dz^l y^k + \&c. = ſ: zdy$. Cujus ſinguli termini (præter primum) habeant Exponentes incognitos. Tum æquationem inſtituo inter duos valores quantitatis dz, quorum alter ex hac ſerie, alter ex æquatione relationem inter z & y definiente per Methodum Calculi Differentialis directam facile invenitur. Ex terminis hujus æquationis ritè reductæ primo determino exponentes incognitos p, q, g, h, l, k *&c.* Et de in coefficientes A, B, C, *&c.* Et ſi plures ſint comparationes, quam quæ determinandis his coefficientibus ſufficiunt, tum ex reliquis deduco Quadrabilitatis conditiones. Si recta ineatur via, Calculus eſt longe facillimus; multaſq; habeo Regulas huc ſpectantes quas alias forſan tradam; ut & uſum hujus Methodi in inveniendis Quadraturis irrationalibus finitis, quando rationales non dantur: res enim omnino in poteſtate eſt.

IV. *An Extract of ſome Letters ſent to Sir* C. H. *relating to ſome Microſpocal Obſervations. Communicated by Sir* C. H. *to the Publiſher.*

Aug. 11. 1702.

SInce my return I have made proof of my new ſet of Microſcopes, made by Mr *Wilſon*, and have found the way of applying them very readily. The contrivance of the Ivory Box and hollow Screw for approach, with the illuminating Convex at the end of it is of great ſervice both by Day and Candlelight, and the Sliders with the plain and concave Glaſs plates for Objects very convenient. But the Braſs Tool I think capable of Improvement, and to want it, and when I come on your ſide I purpoſe to have one made with ſome new accommodations, *viz.* a fine threaded Steel Screw for a more ſteady approach, and ſome new turns and motions to the Arm which carries the Object, *&c.* and I propoſe alſo to have a braſs Arm to ſlide up and down on the ſquare Rod of my deep Microſcope, to which I would with a Screw fix either the Ivory Box, or the handle of the braſs Tool, to be ſet by that means in a ſettled poſture, to any hight or inclination required, which will be very neceſſary when an illuminating Glaſs is applied to either.

As for the Glaſſes themſelves, I think them very good and well wrought, and (tho not ſo neatly ſet) to go far beyond any I have ſeen of *Mellins.* The greateſt Magnifiers eſpecially augment more, and yet ſhew an Object more diſtinct than his. My greateſt ſhew an hair of my head to any Eye conſiderably above an Inch diameter, and ſome

Eyes judge it at leaſt two Inches, but ſuppoſing it a bare Inch, and that (as Mr *Hooke* affirms) 640 hairs breadth make one Inch, the length and breadth of an Object will by it be augmented 640 times, the ſurface 409600, and the ſolidity 262144000.

But the beſt of ours muſt needs fall ſhort in power and goodneſs of Mr *Leeuwenhoek*'s Glaſſes, whoſe skill both in making and uſing them I fear we ſhall not eaſily reach I know many queſtion the ſincerity of his Relations, but I can do him that right to affirm that as far as I am able to follow him (and I have tried many of his Experiments) I find him always faithful in matter of fact, and therefore queſtion not his veracity in other things. 'Tis not fair to ſay I have look'd on ſuch Objects, and found no ſuch thing as he mentions. There is more than an haſty curſory view required in obſervations of this kind, there muſt be patience and attendance, and ſome skill in managing the Glaſſes, Objects and Light to the beſt advantage, beſides there are many lucky hints and coincidences, and all this to little purpoſe without a ſtrong and good natural ſight, and an Eye uſed to Glaſſes; for I ſcruple not to ſay that a diſcerning and critical Eye, as well as a nice and good Ear, is gained and improved by Experience.

'Tis a common and eaſie thing to ridicule all Microſcopical Enquiries, and judge time trifled away in the examining Flies, Mites, *&c.* But certainly the works of God are not leſs beautiful and wonderful in the ſmalleſt than in the greateſt of his Creatures, and many new and ſurprizing, (and 'tis our own fault if not inſtructing) inſtances of his Providence to be found in them. We ſhould think a man very perverſe, who would look into no Books but ſuch as were publiſhed in the largeſt Volume and Characters; ſuch an one would certainly loſe the greateſt part of uſeful learning, and I am confident would not be thought a jot the wiſer for ridiculing ſuch as read ſmaller Prints, tho with the aſſiſtance of Spectacles, which (let witty men ſay what they pleaſe) will ever be eſteemed an uſeful Invention, and (as an old Author ſays) very much *per commodita delli poveri vekki.*

One of the firſt Objects I tryed my Glaſſes by was a living *Louſe*, in which I could plainly ſee the motion of the Muſcles (when he ſtirr'd his Legs) all which are joyned in a longiſh dark ſpot in the middle of his Breaſt, where the Tendons ſeem all united. The like motion of Muſcles is alſo viſible in the head when he ſtirs his horns, and in the ſeveral Articulations of his Legs. I ſaw alſo clearly a multitude of various branchings of Arteries and Veins, and the Pulſe regularly beating in ſeveral Arteries. But the moſt entertaining ſight is the *Periſtaltick motion* of the Inteſtines, which is continued from the Stomach thro all the Guts to the *Anus*. I have obſerved the like *Periſtaltick motion* in a Flea, and in ſeveral ſorts of ſmall tranſparent Maggots and Caterpillars. But a *Louſe* is eaſieſt to be had in all Seaſons, and will bear rougher handling, and live confined between two concave plates, if not cruſhed, 4 or 5 days.

I thought a *Mite* would alſo prove a good ſubject for the like purpoſe, but found them not ſo tranſparent as I expected. However I diſcovered ſomething in my obſervation of them, which may perhaps be new to you. For I plainly ſaw that all the briſtles on the body of one of them (which to a common ſingle Glaſs, and to the greateſt Magnifier of my three glaſſed Microſcope look like plain ſmooth hairs) were when viewed with a large Augmenter all ſpicated (if I may make a word) or bearded like the Ear on the Seed head of ſome Graſſes. The appearance was like the annexed figure, which ſhews part of the briſtle, but I cannot expreſs the beauty and regularity of it, and every briſtle on the whole Body and Legs, both long and ſhort, had the ſame formation. But I muſt tell you withal, that all Mites are not ſo, for of 7 or 8 incloſed together, I found but one whoſe briſtles were of this make, in the reſt the horns only were ſpicated. Whether they were of different

Fig. A.

kinds, or rather only of different Sexes, I ſhall not determin, they were all taken out of the ſame Cheeſe at the ſame time, and were in other parts very like. Their Mouths opens Horizontally (to the right and left) like that of a Wasp, and hard headed Maggot, and after their being ſome days ſhut up together I found ſome dead, and the Survivors preying on them, which gave me an opportunity of obſerving their manner of feeding,which was very remarkable,for they thruſt one mandibule forward, and bring the other backward at the ſame time, and this alternately, and by that means ſeems to grind their food.

If you ſhould bring one of the greateſt Magnifiers to obſerve a Mite or the like minute Animal, you muſt lay him on a thin Muſcovy Plate in one of the Sliders, and cover him with a Concave, and take good care not to cruſh the Object between the Plates in your approach.

Aug. 25. 1702. Since my laſt I have been a few days at G——— and in my return (over the Sands) I pull'd off an Handful of *Muſcles*, which ſtuck on a piece of a Rock that was covered by the Sea every Tide. Theſe I brought with me,that I might obſerve the Organs by which they fix themſelves ſo firmly to a Stone, that even a Storm will not waſh them off. I found that theſe were threads which came from that part which is called the Beard of the Muſcle, which had on their extremity, a flat ſpungy ſubſtance, that adhered only by impoſition, like the wet pieces of Leather which Boys faſten to Stones, and they are deſcrib'd, and well pictured by Mr *Leeuwenh.* But my principal end in gathering theſe Muſcles was, that I might view and examine the Inhabitants of thoſe little white Shells, which ſtick like Puſtules on Muſcle-ſhells (as they do likewiſe on Lobſters, Oyſters, Stones, *&c.*) Theſe are alſo mentioned by Mr *Leeuwenh.* who gives a picture of one of theſe little Creatures taken out of its Shell. His Draught is very accurate, only that in the 12 long Branches growing from the Head, the briſtles are there pictured coming out quite round on each joynt of every Branch, whereas they grow only on the inſide, (all the hind part being perfectly bare) and look not unlike a ruffled Feather ſtript on one ſide. I cannot gueſs at the uſe of theſe curious ramifications, unleſs they ſerve to draw in food to the Creature, which cannot move out of its place. For keeping them alive in Sea-water, I ſaw them often put them out thro the ſlit of the *Operculum* which cloſes the top of the Shell, and draw them in again. This as I remember the Naturaliſts call a *Balanus* and claſs it with the *Concha Anatifera.* I never ſaw the latter, but that being much larger, if (as 'tis probable) it has the like Organs, we may eaſily account for the miſtake of even ſome obſerving Men, who affirm they have ſeen them Feathered, and think them Birds *in fieri.* I have herewith ſent you ſome Muſcle-ſhells with theſe *Balani* adhering to them, and becauſe they are tender to manage, and great care is required to take them clean out, and diſplay theſe curious parts, ſo as to ly fair and in good order, I have ſpread 2 or 3 of them on a piece of Glaſs, that you may ſee them your ſelf. I have alſo ſent you ſome *Cancelli* (a Lobſter like Animal) in the Perewinkle Shells which they inhabit, and have broken off ſome of the Shell of one, that you may ſee how this Fiſh holds himſelf in by an hook on each ſide of his Tail. Theſe *Cancelli* are excellent Meat.

Some of the Muſcles which I brought were little above a quarter of an Inch long. I took one of theſe out of the Shell, and expoſed it to the Microſcope on a thin Plate of Muſcovy Glaſs, and holding it to the light of a Candle, I ſaw in the thinner parts a vaſt number of Veins and Arteries, and the blood circulating in them more diſtinctly than I ever ſaw it in any other Animal. For I had this advantage in the Obſervation, that the Object lay always quiet, without changing Place, and my Plate was ſo thin, that I could bring to it what Magnifiers I pleaſed, and look without diſturbance as long as I pleaſed, and I had moreover the Satisfaction of ſhewing it to 2 or 3 curious Perſons, who had ſeen the circulation in other Creatures, for whereas other Animals will not eaſily be brought to lye ſtill any conſiderable time, and will not live long when expoſed to a Microſcope, this lay always in the poſture it was placed, and the motion of the Blood continued with little alteration 6 or 7 hours, only by keeping the Object moiſtened with Sea-water, and might have laſted much longer if I had not thrown it away. I repeated the ſame Experiment for 2 or 3 days with ſome of the remaining Muſcles, with little difference in the Succeſs.

The other day I ſpyed running among ſome Fruit, a ſmall Worm which I could perceive to have a multitude of Legs, it was not half an Inch long, and the Body not thicker than an Hog's Briſtle. This I put alive into a ſmall Tube, and found it a perfect *Scolopendra*, whoſe Body was made up of 60 Inciſures, at every one of which was a pair of Legs (one on each ſide) and each Leg had five Articulations. On his Head were 2 Horns, each of 16 Joynts, and under it a pair of terrible Forcipes, red, crooked, and pointed like the Talons of an Hawk, and I often ſaw him open and ſhut them, and wipe his Horns thro' them. Theſe Forcipes are not unlike, and probably for the ſame Uſe as thoſe on the Head of a Spider, but they are difficultly ſeen (becauſe generally kept cloſe) in a living Spider, but you may readily find them open'd, and in their perfect Shape, in the Spider's *Exuviæ*, or caſt Coats.

This Subject reminds me of a ſmall black flat *Tick*, which (after walking in a Thicket) I found ſticking on my Arm, and it had got its forepart ſo far into the Skin, that I had much ado to ſeparate it with the point of a Needle, ſo as to preſerve it intire and unhurt. I obſerved the Snout of *Fig.* B. this to be ſhaped not very unlike the jagged *Proboſcis* of the *Serra Piſcis*. The forepart of it *a* being like the end of a broad-pointed Sword, is clear and tranſparent, and has 3 Teeth on each edge, below which there comes out another ſerrated part *b b* on each ſide almoſt at right Angles; but this is partly hid (when you look on the Back) by a thick Horn *c* on the ſide of the Head. I broke off one of the Horns at *d*, and then it appeared as in the annexed Figure, which repreſents the fore part of this *Tick*, and tho' rudely drawn, will give you a better Idea of it, than many words from an haſty Pen.

I afterward examin'd the Snouts or Proboſcis of *Dog Ticks*, to ſee if they had the like Conformation, and found their Appearance as in Fig. *B* 2. the Snout *a* being ſo covered by the two clumſy thick Horns *b b* that the ſerrated Edges could not be perceived, but ſeparating the Horns (with ſome difficulty) they appeared in the Poſture of *Fig. B* 3. and I could then plainly ſee 8 Teeth or Jaggs on each ſide, as here expreſſed, but the Snout of a *Dog Tick* has not the additional ſerrated part, which is in the *Wood Tick*. I could alſo perceive a Pipe or Channel run through the Snout, and ſee ſome Bubbles move up and down in it, which I have alſo endeavoured to repreſent.

Sept. 8. 1703. My long Letters did not deſerve ſuch a Reception as ſhould encourage the Continuance of them. I keep no Notes of what you call Obſervations, but ſent you what came uppermoſt in the Order that occur'd to my Memory, and in no other Dreſs than what was haſtily clapt on.

I have had a very entertaining Diverſion with Pepper-water and ſome other Infuſions, which I have kept by me ever ſince my return, tho' I have often formerly obſerved the like Waters, yet I never ſaw the *Animalcula* ſo much to my Satisfaction as in my new Glaſſes, which I have now increaſed to above double the number of my firſt ſet. I have found ſome of theſe *Animalcula* almoſt incredibly minute, which appear even to my greateſt Magnifiers not ſo large as a Mite to a naked Eye, and in the bigger ſort, I can plainly ſee the little Feet by which they perform ſo briſk Motions, which I never could find before. But I doubt not but your own Microſcopes had ſhew'd you what is diſcoverable in theſe Liquors, and therefore I ſhall ſay no more of them. Only I cannot omit mentioning one ſort of Animal in them, which I never diſcover'd till within theſe 3 or 4 days, and by reaſon of their minuteneſs may poſſibly have eſcaped you alſo. Theſe are very ſlender long Worms, of which my Pepper-water is prodigiouſly full. They are all of the ſame thickneſs, but their lengths are very different, ſome being twice, and ſome thrice as long as others, and at a Medium I judge the Proportion of their length to their breadth at leaſt as 50 to 1. Even to the largeſt Magnifiers they look like Shreds of Horſe-hair (to a naked Eye) from a quarter to 3 quarters of an Inch long. Upon a modeſt Eſtimate their thickneſs is not the 100th part of an hairs breadth, and conſequently if you imagine an hair of your Head ſplit into above 7800 equal Fibers, each Fiber would be as thick as one of theſe Creatures. Their Motion is equable and ſlow, and generally they wave their Bodies but little in their Progreſſion, tho' ſometimes they make greater Undulations. But what is more remarkable, they ſwim with the ſame Facility both backward and forward, ſo that I cannot diſtinguiſh at which end the Head is, and I have ſeen the ſame Worm go forward with one end, and back again with the other end foremoſt above 20 times together. And ſometimes they will (like Leeches) fix one end on the glaſs plate (on which I lay the Water) and move the looſe part of their Body round about very oddly. Theſe I take leave to call *Capillary Eels*; and I have given you as well as I could a repreſentation of their Appearance to a great Magnifier, in the ſeveral Poſtures I have ſeen them ſwim.

I find the Duſt of the *Fungus Pulverulentus* or *Puff-Ball* to be the minuteſt Powder that I ever ſaw: To a naked Eye you know (when 'tis cruſh'd) it appears like a Smoke or Vapour, and with a common Microſcope you cannot diſtinguiſh the Particles. But when 'tis viewed with the greateſt magnifiers, each grain is viſible and exactly alike, and appears a perfect ſpherule of an Orange colour, ſomething tranſparent, whoſe axis is not above the 50th part of the Diameter of an Hair. So that a Cubical Veſſel of an Hairs breadth of a ſide, would hold 125000 of them. This was the duſt of that *Fungus* which is bigger than your two Hands put together, and I obſerved ſince in another Puff Ball of the ſize of a ſmall Crab (which I take to be a different kind) that all the Globules were darker, and that every one had a little Tayl or Stalk affixed to it. I at firſt imagin'd that theſe (tho ſo minute) might be Seeds, but was ſoon cured of that fancy when I found that the ſmut of Corn was compoſed of the like regular Globules, and about the ſame ſize. My way of obſerving theſe and the like duſts, is to breath gently on a thin Muſcovy Plate, and then covering it highly with the Powder, to blow it off again, for enough will adhere, and they ſhould not ly in confuſion.

I have met with great variety of very beautiful minute Flies and Inſects on Leaves and Flowers, (for at this time, of the year every thing is full of Animals) eſpecially one very pretty Grub which I found plentifully adhering to Nettle-leaves, which is a wonderful thin Creature, has a ſort of a covering all over his Back like a broad Shield, which he lies under like a Tortoiſe, and is all over beſet and fringed round with Spikes. 'Tis almoſt impoſible to deſcribe ſuch creatures tolerably, or give you an Idea of them, unleſs I could draw, but I have preſerv'd ſome of theſe for your own view.

Sept. 29. 1702.

'Tis a double ſatisfaction to me that my own diverſion contributes any thing to yours, and therefore without farther Apology for my haſty uncorrect way of Scrible, I ſhall continue, when I want other matter, to fill up my Letters as you command.

The end of laſt week a *Buck* which by miſchance had his Leg broke, was kill'd tho ſo late in the Seaſon, and it being rutting time I thought I might with the greateſt advantage obſerve the *Semen Maſculum.* Not to trouble you with ſome former attempts of this kind, as ſoon as he was killed I took out one of the *Teſticles* with the adjoyning *Seminal Veſſels*, and found the *Vaſa deferentia* very turgid, and full of a milky fluid. After various methods of viewing this Liquor, I ſaw the *Animalcula*, (in prodigious numbers) very perfectly in ſeveral poſtures moving very briskly, and ſhew'd them to others, who own'd they appear'd as plain as Tadpoles to a naked Eye. The greateſt task was to lay them thin enough before the Microſcope, for when the matter is too thick, you ſee nothing diſtinctly, but only a confus'd motion, and when thin ſpread it dries immediatly, ſo that you muſt be very quick with it, or you will loſe your Labour. I diluted ſome of the *Semen* with warm Water, juſt ſo much as would a litte change the colour of the Water) and by that means could ſee them more diſtinct and ſeparate, even with ſmaller Magnifiers, and they then kept their ſhapes long, even till next day when put in a ſmall Tube, but were without motion. To *Fig.* D. my beſt Glaſſes they appeared about the ſize, and in the poſtures here repreſented.

In my Obſervations of the *Animalcula in Waters* I have many of the ſame ſpecies in the ſeveral infuſions, and even in Waters that have been expoſed (eſpecially at this time of the year) any time without any particular mixture, ſuch as you find in the hollow of a Cabbage-leaf, or on the *Dipſacus*, &c. and I am confident that many of theſe are the ſame Creatures under different dreſſes. For I have noted ſuch a regular proceſs in them, and ſuch a conſtant order of their appearance, that I am of opinion moſt of them are the product of the Spawn of ſome inviſible *Volatile Parents*, and generated like Gnats, and many other ſorts of Flies, which are bred, and undergo many changes in the Water, before they take wing. But I pretend not to ſufficient obſervations to give you this for more than a conjecture. Some of them alſo may probably be originally *Water Inſects*, or *Fiſh ſui* *generis*, and are ſmall enough to be raiſed in Subſtance or in Spawn, with the Vapours, and again to fall with the Rain, and may grow and breed again in the Water when kept, and this will ſeem leſs ſtrange to you, when I aſſure you that I have ſeen, and when I am ſo happy as to wait on you next, will ſhew you Fiſhes, ſome as ſmall as Cheeſe-mites of different ſorts, very wonderfully made, which are of the cruſtaceous kind, ſhell'd with many joynts, with very long Horns, fringed Tayls, and have many Legs like Shrimps, curiouſly made, and that ſome of theſe carry their Eggs or Spawn under their Tayls in one Bag, another ſort in 2 diſtinct Bags, and ſome kinds on the fringes of their Legs like Lobſters. But to confine my ſelf to the *Animalcula* I was ſpeaking of, becauſe you tell me your Pepper-water is come to a miſchance, I have incloſed ſome Scetches in my rude way of Drawing, of ſome of the moſt remarkable which I have obſerved in mine. Thoſe marked *E.* are very common, and deſcribed by Mr *Leeuwenh.* in ſome of the firſt Tranſactions, but I think neither theſe, or any of the reſt are any where pictured. I have ſeen the Tayls of ſome of theſe 9 or 10 times as long as their Body, (which is about $\frac{1}{3}$ of an Hair's breadth Diameter) but generally they are 4 or 5 times as long. As they move they will often twich up the Tayl in the poſture as marked at *b*, and this Spring is ſo ſtrong as when the Tayl is intangled, (as generally it is) by the end, they bring back their whole Body by the jerk, and convolution of the Tayl, which ſoon returns to its firſt ſtraightneſs. To a good Glaſs the end of the Tayl ſeems to have a nob on it as in *a*, and the folding appears as in *b*, but examining it with one of the greateſt Magnifiers, I found the knob to be only a cloſe ſpiral revolution like the Worm of a Bottle Screw, and that the whole Tayl when twitched up was alſo a ſpiral. I have endeavour'd to repreſent this appearance (to the great Magnifier) in *c* and *d*. I have alſo ſeen them ſometimes as in *e*. I have farther obſerved that when theſe ly ſtill, they thruſt out a fringed or

Fig. E.

bearded Mouth, which they can draw in again, and that a rapid ſtream runs conſtantly toward their fore part, as if they drew in water, but I rather believe this current is made by a nimble tremulous motion of ſome minute Fins or Legs, which my Glaſſes will not diſcover.

Thoſe *Animalcula* marked *F.* are alſo plentiful in all the Waters and are the largeſt of all, and I can ſee them in a good light and poſition (without any other aſſiſtance) with my bare Eye. Their length being about the breadth of a Hair. Theſe have a very quick motion, and are perpetually beating about like a Spaniel in a Field, and by their frequent turns and returns, ſudden ſtops, and caſting off, ſeem to be always Hunting for Prey. Their Bodies are very thin, that which I take to be the Back being much darker than the other ſide, and you ſhall ſee them frequently turn ſometimes one ſide and ſometimes the other toward your Eye, and many times you may ſee part of each. Their edges are as it were fringed with a multitude of very minute Feet, which are moſt conſpicuous about the Head and hinder parts, where are alſo ſome Briſtles longer than the Feet, which ſhew like a Tayl, *a* ſhews one of theſe with the Back, and *b* one with the Belly toward you, and in *c* and *d* I have endeavoured to repreſent it as it often appears in other poſtures. I put ſome ſhort ſhreds of my Hair into their Water to compare their magnitudes by, and ſaw that they could uſe their Feet in Running as well as Swiming, for they would often ſtand on an Hair, and go on it forward and backward from end to end, often ſtooping down, and bending themſelves in ſeveral poſtures.

Among theſe are generally another ſort (but not above ⅓ of their ſize (whoſe feet are alſo very viſible, ſome of them are ſhaped almoſt like a Flounder,. and others are rounder behind, for by their motions and actions I judge them the ſame Creatures. Theſe alſo will ſtand and run on an Hair, or any filth in the Water, they are marked *a b* Fig. G. I have likewiſe ſeen them double as at *e*, and go forward

Fig. G.

ſo, like Flies in Copulation. I was ſurpriſed at the firſt view of this, thinking it a ſingle Animal of that ſhape, but have ſince often obſerv'd them both joyn and ſeparate, and 2 of them following a 3d, ſometimes the firſt, and ſometimes the 2d laying hold of it, and driving off the other.

I forgot to tell you that the little Feet of theſe Animalcles are moſt diſtinguiſhable when the Water is juſt drying off, for they being then ſtranded cannot change their place, and if you watch that nick of time. You may ſee them move their Feet very nimbly, and diſtinguiſh them ſome little time after the Water is evapourated.

I have not time or room to explain the other Figures in the Paper, but you may expect more by my next.

Octob. 6. 1702.

I thought thoſe which I call'd Capillary Eeles had been peculiar to Pepper-water, but have ſince obſerv'd the ſame (tho but few) in ſome ſtanding water which dreined from an Horſe Dunghill. This Liquor was Mum-coloured, and the moſt pregnant of all that I had ever ſeen, and it would look incredible if I ſhould tell you what a prodigious number of all ſorts I eſtimated to be in a quaintity of it of the magnitude of a Pepper Corn, for they appeared as thick as Bees in a Swarm, or Ants on an Hillock, ſo that I was obliged to dilute the Water to obſerve the particular ſorts. I found in this not only almoſt all the Animalcula. I had ſeen in the other infuſions, but many ſorts which I never met with before. Among them were in great number plenty thoſe which are repreſented in *H.* their extream parts look bright, and the middle dark, and ſeems beſet with Briſtles, and their Tayl is pointed with a long ſprig at its end, their motion is ſlow and wadling. *Fig.* H.

But the pretieſt object was a great number of a kind of Eeles, which appear moſt diſtinctly when the Water is almoſt dry, which make briſk ſhoots, and have a pretty wrigling motion, they are of different lengths, and are about the thickneſs of what I call Capillary Eeles. I have drawn *Fig.* K. ſome of them at *K*, with ſome of the Capillary Eeles among them, that you may better judge of their proportions.

I preſerved ſome of this Dunghill-water by me 7 or 8 days, and found the number of theſe little Eeles decreaſing every day, till I could hardly find one in it, tho they were as plentiful as before in the Water newly taken up. And on the contrary I obſerved great numbers in the kept Water, which are very ſcarce in the freſh. *Fig.* L. Among theſe is one ſort very ſingular in its ſhape and motions. Its body is Spherical, only a little pointed like a Pear, and it ſeems very pliable like a Bladder fill'd with Water, in which are a vaſt number of dark particles in confuſed agitation. Their moſt remarkable motion is a revolving one, they will turn ſometimes above an 100 times, ſometimes not half ſo faſt in a minute the ſame way, and then ſtop, and turn the contrary way, and all this without moving a Hairs breadth out of their place. They will alſo go forward, turn and return, and fetch a large compaſs with many Deviations, and in their progreſſion they always (even in the ſhorteſt turns) keep their pointed end foremoſt, the revolving motion ſtill continuing. And when the Water dries their Skin breaks, and the encloſed Liquid diffuſes. I have given their ſhapes at *L*. Theſe are of different magnitudes.

Fig. M. There is another ſort, repreſented at *M*, in great numbers, which are near as long as the biggeſt kind formerly mentioned. Theſe have brisk motions, and are very active, and have many feet before very viſible. They will often contract, and again lengthen themſelves as they Swim, but eſpecially when the Water dries, they will ſhrink themſelves up into a Globular figure, and the feet then ſtand out, which you may ſee move very nimbly a conſiderable time after. Theſe alſo are of different ſizes *a a* ſhews them at their length, and *b b* repreſents them contracted.

I have alſo given you the figure of another oddly made

Animal

Fig. N.

Animal not uncommon among the reſt, which is as large as the former, and in its motion (which is very nimble) keeps always the ſharp end foremoſt. I have obſerved ſome variety in theſe (tho I take them to be of the ſame ſpecies) ſome of them being clear, and curiouſly ſtriated from the point to the thick end, others only having a fore part clear, and the Bottle dark, as is ſhew'd at *a* and *b*, but I cannot by any Glaſs find the Organs by which they move

Theſe I have mentioned are the moſt remarkable for their ſize and motions, there are great variety of others which I pretend not to deſcribe and cannot draw, your own Waters are doubtleſs as fertile in theſe productions as ours, and your own view of them will be infinitely more ſatisfactory than any thing I can write.

I have preſerved ſuch of the Objects mentioned, as are capable of it, with many others to ſhew you when I come to *Aſton*, (which I hope quickly to do) and particularly ſome of thoſe Mites with ſpicated Briſtles formerly mentioned, of which I have ſince found ſeveral.

I had forgot to tell you that I found a curious Mechariſm in a ſmall *diving Inſect* which Inhabits ſtanding Waters. 'Tis like a ſmall fly, with an Head like an Houſe Cricket, but in the place of Wings it has 2 paddles on the Shoulders, and on the end of the hinder Legs, (which are longer than the other 4) inſtead of Feet and Claws are perfect Oars. I have alſo taken notice in 2 or 3 ſorts of Flies, that behind the Eyes, on the top of the Head, are placed three Protuberances (in Equilateral Triangle with the point foremoſt) with a black ſhining Globe in each, like a Ball in a Socket, and are ſo diſpoſed as if made to look directly backwards. They are perfectly ſmooth,and without thoſe Hemiſpherical diviſions, viſible in the Cornea of the Eyes of the Fly and Beetle kind, but appear more like thoſe of a Spider. I have preſerved a very fair one of theſe to ſhew you.

Having ſome room left, I ſhall here add that I have tried ſeveral ways of killing the *Animalcula* before mentioned, by mixing Salts, Spirits and Acids, *&c.* with their Water, the leaſt touch of which will immediately deprive them of motion and life. But I never yet ſucceeded in any tryal of recovering or reviving them after the Water was evaporated, by the addition of freſh Water, tho ſome have affirmed they may be revived by that means even an hour after, nay ſomebody in one of the Tranſactions ſays they will recover after the Water is boiled. Many of thoſe I have mentioned burſt when the Water dries, and tho ſome keep their ſhapes a little while, yet they too alter in a few minutes, and I cannot imagine them recoverable.

LONDON, Printed for *Sam. Smith*, and *Benj. Walford*, Printers to the Royal Society, at the *Prince's Arm's* in St *Paul*'s Church-yard.

V. *An Account of a Book.*

Hippocratis Aphoriſmi, cum Commentariolo. Auctore Martino Liſter, *e Medicis Sereniſſimæ Majeſtatis Reginæ* Annæ. Londini *Typis* W. B. *Impenſis* A. & J. Churchil, *ad Inſigne Nigri Cygni, in vico vulgo dicto* Paternoſter-row. 1703.

HUjus Commentarioli rationem reddere idem eſſet, ac ſi quis ſingula in ſingulos Aphoriſmos ab Authore dicta, tranſcriberet; qui fere totidem præcepta ſunt de corporis œconomia, tam ſanitatis, quam valetudinis adverſæ ſtatu; illudque adeo tanqam ſuper vacaneum omittendum credidit. Quæ verò ad hunc ſuperioremque ejus tractatum in *Sanctorium de medicina ſtatica* peculiariter ſpectant, nempe *humorum concoctiones*, paucis ponenda eſſe videntur.

Humorum itaque ſecretio ſive percolatio è ſanguine, cui nulli omnino naturaliter inſunt, ei eſſe videtur longè maximus error, cauſaque præcipua, cur fruſtra adhuc exhibitæ fuerunt tot hypotheſes, ad explicandam naturam humanam: hinc, inquit, tot & tantæ hallucinationes ortæ ſunt; nimirum ſanguinis fermentatio, ejuſque ab humoribus depuratio, ſuccus neſcio quis nutritius, (qui aliàs liquidum nervorum, ſpirituſve animales dicitur) copia incredibili per inſenſibilem tranſpirationem jugiter amittendus, & ſimilia. In hujus autem rei gratiam nervi, reclamante anatomia pertuſi ſunt, perinde ut de univerſis fibrillis partes corporis organicas conſtituentibus fabulantur, nempe eos concavos eſſe, more tubulorum; etiamſi ii *ope conſpicillorum* vel exquiſitiſſimorum nondum alii detecta ſunt quam

quam ſolida quædam filamenta ; imo neque hactenus *morborum beneficio* aliter viſa ſunt ; qui tamen alia omnia vaſorum genera aliquando varicibus amplificare ſolent, ut vel nudis oculis tandem conſpicua ſint. Canes nobis (ut id hic obiter notem) non tantùm jugulandi, ſed omni morborum genere de induſtria afficiendi ſunt: ita et medicamentorum vires, & partium quarumcunque fabrica, uſuſque citò & clarè elucebunt : quam certé methodum junioribus noſtris, & athletica valetudine gaudentibus, vehementer commendo, à quâ mirabiles progreſſus in re medica auguror.

Cum itaque *ſecretio humorum* quorumcunque é ſanguine, integra valetudine firmaque exiſtente, *mera fictio* ſit, ipſe Author non ſine optima ratione, ut arbitratur, ejus loco, humorum concoctiones in viſceribus glanduliſque ubique ſubſtituit, ex una ſcilicet atque eadem pura puta ſanguinis maſſa ; ſiquidem viſcera quæque majora, viſcellaque quas glandulas vocant, non mera itinera ſunt ad humores tranſmittendos, eoſque in ſe recipiendos, deponendoſque ; ſed ipſæ quoque officinæ ſunt, ubi quilibet humores conficiuntur, ſuumque characterem ultimum atque diſcretivum induunt: & quemadmodum chylus in ventriculo liquatur, id eſt, extra atque ante ejus ingreſſum in ſanguinem ; ita ſinguli quique corporis humores fabricantur extra citraque ſanguinis circulum ; non excepta inſenſibilis perſpirationis materia, etiamſi omnium humorum longe copioſiſſima ſit : quod minus mirandum, cum ultima & conſummatiſſima ſit omnium & ſingularum totius corporis officinarum concoctio atque diſpendium ; non ſecus, atque flatus in inteſtinis ex unius fere chyli concoctione.

At nervos concavos eſſe, neceſſe eſt ; nam omnino (ut nuper *Quidam*) ita vult mechanica Philoſophiæ ratio, id quidem *petere principium* eſt, audacter nimis, præterque ſummam virtutem modeſtiamque diſciplinæ mathematicæ, quæ nihil unquam poſtulare conſuevit, niſi facillimum datu,

&

& ex ſua natura perſpicuum. At quorſum hæc tua feſtinatio? nemini certe pudori eſt, fateri non poſſe ulteriùs progredi in hac vel illa functionis corporis exponenda: interim Anatomiam colas velim; ſat cito calculi adhibentur, cum rerum naturæ Hiſtoria uberior ſit, & per ſe explicatior.

Fatetur Author jam diu eſſe, cum non pauca ad humorum concoctiones ſpectantia exaraſſet, eaque edere cogitaſſet ſed rem diſtulit, quod ſperavit, a ſumma hujus temporis induſtria, glandulas pleraſque non potuiſſe diu latere, ſed eas ſingulas jam jam deſcribendas, tranſituſq; ſanguinis in eas rationem clare exhibendam fore; cum ipſa res expertiſſima ſit.

Peieri autem ſimilitudo, quâ ventriculus inteſtinaq; cum lacteorum vaſorum appendicibus, glandulæ comparantur, elegans quidem & multi ingenij imaginatio eſt; ſed *Bellino* impoſuiſſe videtur, cùm inde affirmaverit, glandulas tantùm varſorum ab arteriis exeuntium longitudine, numero, craſſitieq; inter ſe diſcrepare: Illud tamen veriſſimum, (quantum video) Glandularum fabricam pene unice in Anatomia, certe maxime & vehementer, deſiderari: ſed fabrica cujuſq; partis demonſtranda, non cæca aliqua conjectura fingenda eſt.

Miſſa itaq; in præſentiarum peculiari humorum doctrina, quam meditor, quatenus ſcilicet ex concoctionibus ſanguini extraneis deducendi ſunt, unum interim alterumq; conſiderandum offert Auctor: nimirum *primum*, an abſurdum ſit cogitare, cùm ex immenſa varietate cibi potûſq; unus chylus intra ventriculum perpetuò conficiatur, idemq; lacteis venis propter ſummum ſuum candorem, dulcedinem, puritatemq; mirifice conſpicuus, ad eundem modum ex uno eodemq; ſanguine, minime difformi, ſed ſibi per omnia ſua vaſa ſimili, multiplicem humorum varietatem poſſe conſequi, certe viſceribus glanduliſq; plurimum inter ſe diſcrepantibus, quas totidem ventriculos concoctionum reſpectu eſſe diximus.

Al

Alterum illud, quemadmodum univerſæ corporis partes ſive membra ejus *ſimul* extant, nec unum alteri ſuperinducitur: (fœlix ſeculi præteriti inventum;) ita illorum omnium vaſa non vacua genita fuiſſe, ſed ſingula ſuis humoribus connatis repleta; ut ſcilicet in promptu ſit quoddam condimentum, ad ſanguinem iis continuò impulſum, cùm vita & nutritio incœptura ſit, jn varios proprioſq; humores digerendum.

Hæc autem pauca ſufficiant, ad aliquam certe pleniorem intelligentiam ejus, quod toties in duobus commentarijs de humorum concoctione paſſim expoſitum fuit.

LONDON, Printed for *Sam. Smith*, and *Benj. Walford*, Printers to the
Royal Society, at the *Prince's Arm's* in St *Paul*'s Church-yard.

BRITISH MUSEUM
NATURAL HISTORY.

Fig: 1.

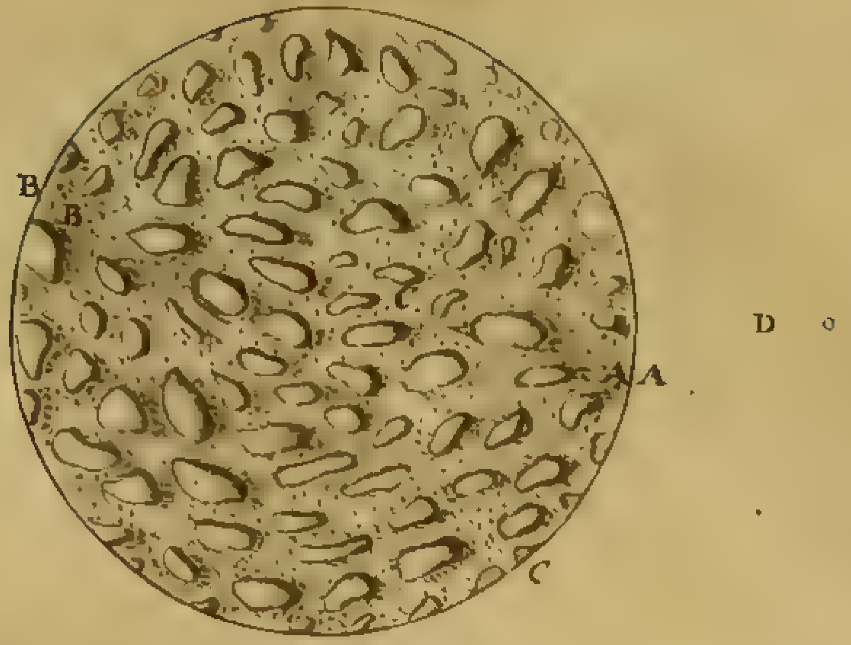
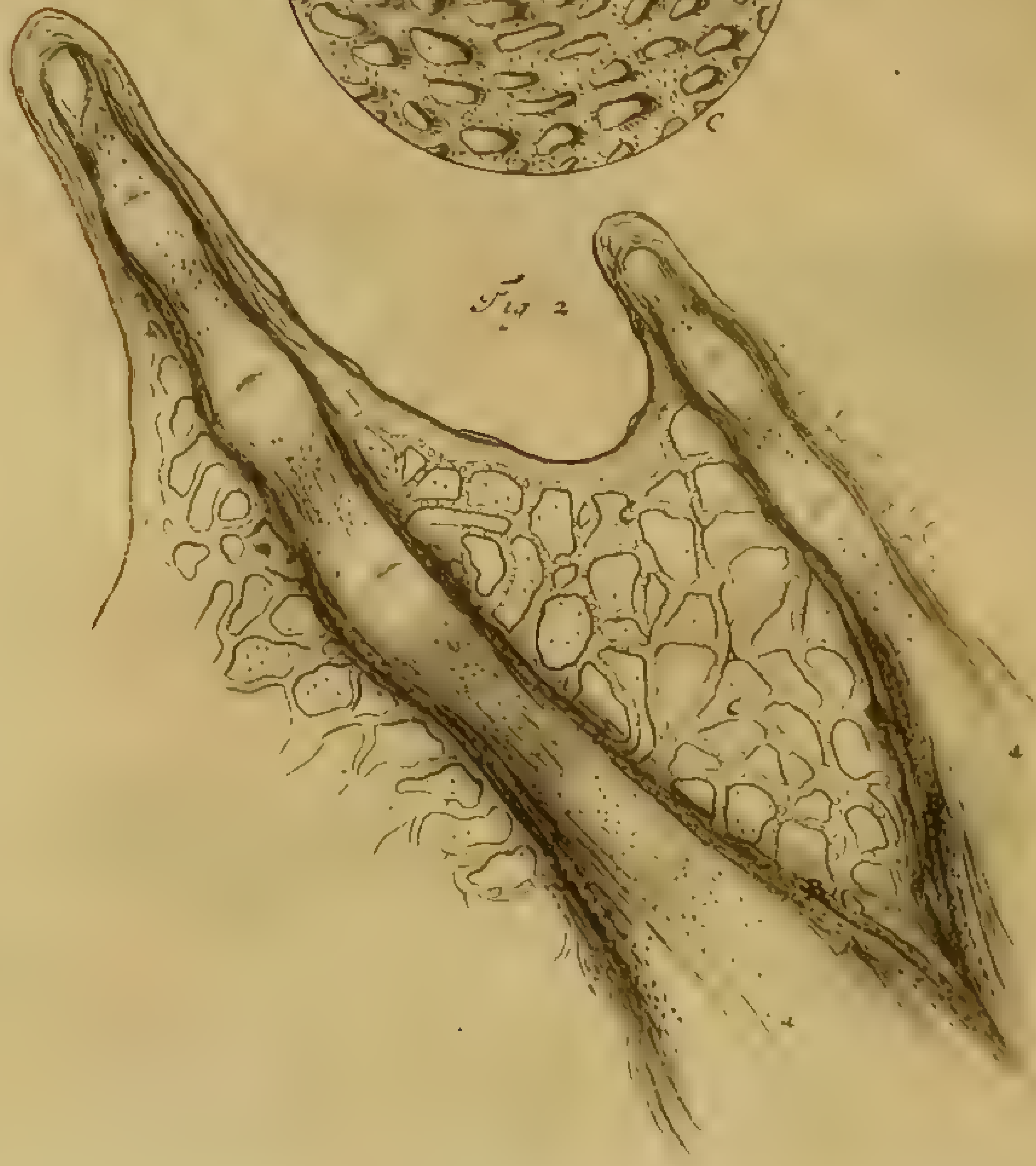


Fig 2



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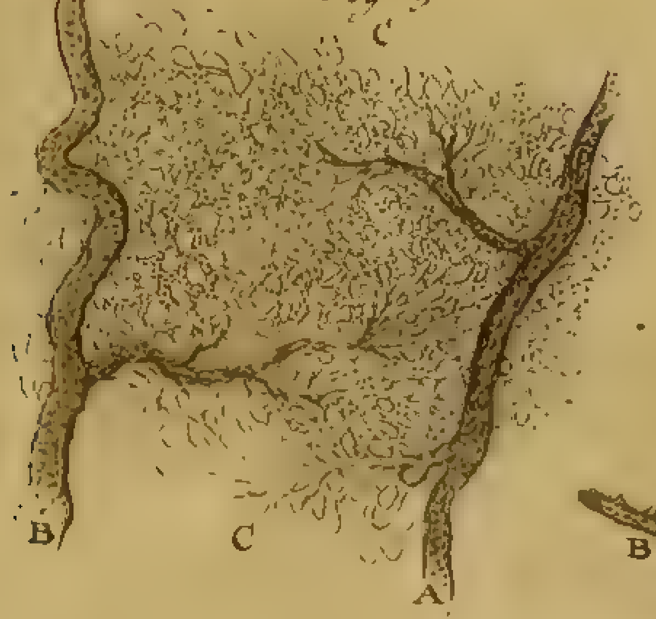

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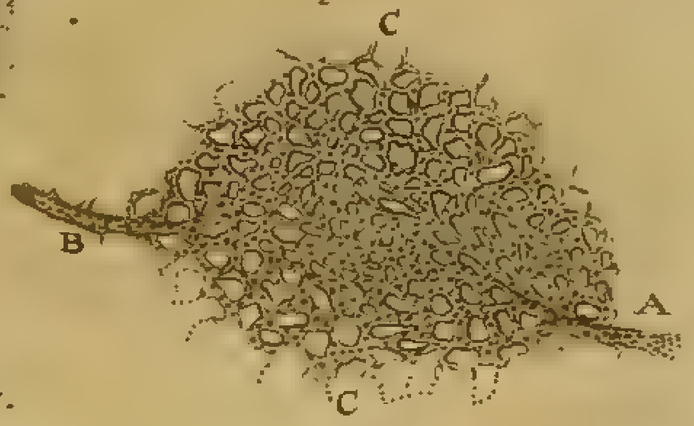
Fig: 4.



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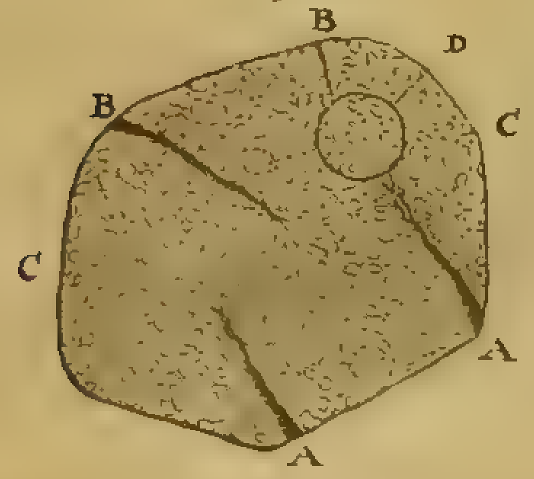
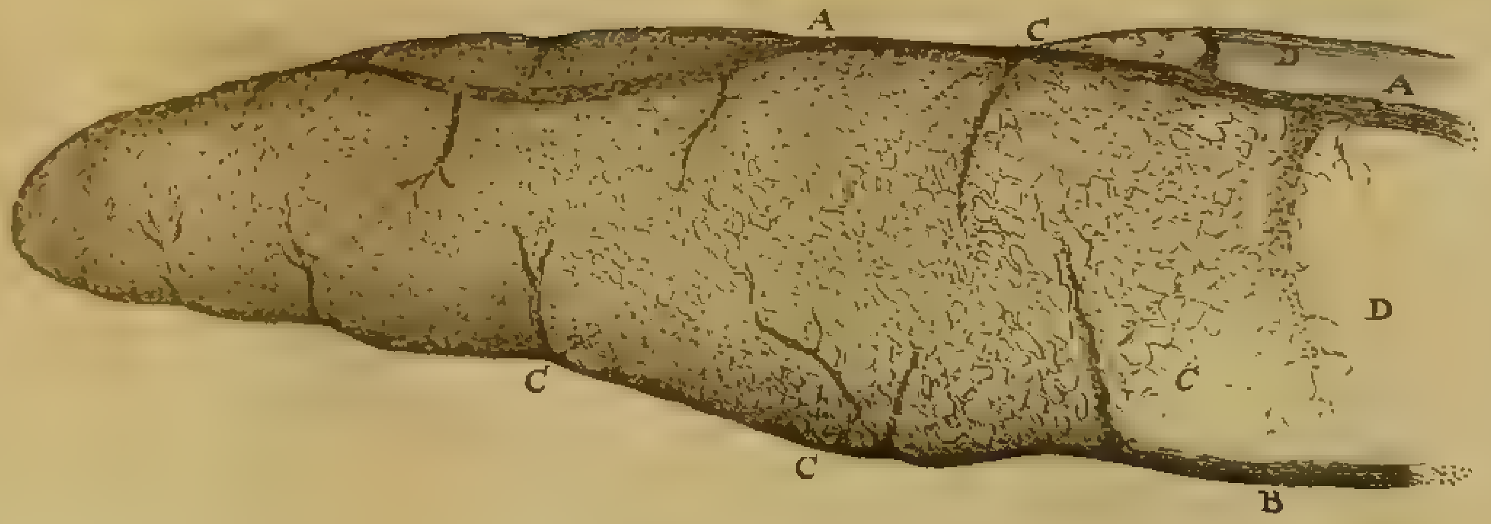


Fig: 6



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PHILOSOPHICAL TRANSACTIONS.

For the Months of May *and* June, 1703.

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V. *An Account of a Book.* Gazophilaci *Naturæ & Attis;* Decaſ. I. *In qua Animalia Quadrupeda, Aves, Piſces, Reptilia, Inſecta, Vegetitabilia;* item *Foſſilia Corpora, marina, & ſtirpes Minerales* e *Terra eruta,* Lapides *figura inſignes,* &c. *Deſcriptionibus* brevibus *& Iconibus* illuſtrantur. *Hiſce annexa erit* ſupellex Antiquaria, *Numiſmata,* Gemmæ *Exciſæ* & *Sculpturæ,* Opera *Figulinæ, Lucernæ, Urnæ, Inſtrumenta* varia, *Inſcriptiones, Buſta,* reliquaq; *ad rem priſcam* ſpectantia; Item *Machinæ,* Effigies *Clarorum Virorum,* omniaq; *Arte* producta. *A Jacobo Petiver* Pharmacop. *Lond.* & Regiæ Societatis *Socio.*
Londini ex Officin. *S. Smith* Cœmeterio *D. Pauli,* & *Chriſt. Bateman* in vico vulgo dicto *Pater noſter-Row.* 1702.

I. *A Letter to Dr* John Wright, F. Col. Phyſ. Lond. *to Mr* Wm Cowper, F. R. S. *concerning the Cure of an Apoſtemation of the Lungs.*

SIR,

ACcording to your deſire, I ſend you the Caſe of Mrs *Jane Terry*, Niece to Mr *Fowkes* in *Curſitors-Ally*, near *Lincolns-Inn*, and thank you for your aſſiſtance in her Cure, to which your extraordinary skill in your Profeſſion very much contributed. I doubt not but an account of her, from the firſt time I was concerned with her, will be acceptable to you. I knew her ſome time before ſhe fell ill of the Small Pox, which was in *May* 1701. She was about 18 years old, of a freſh Complexion, and pretty fleſhy. Her Relations apprehending ſhe might have the Small Pox, removed her to a Nurſes Houſe, where ſhe had the diſtinct ſort very kindly, her Caſe proceeded ſo very well (as they conceived) that no Phyſician was called to her, till they began to ſhell, only for ſome days before ſhe had a little difficulty in her breathing, which gradually increaſed till ſhe began to raiſe Blood, which was about the 7th day from their firſt appearing. This raiſing of Blood was accompanied with theſe circumſtances; it had increas'd every day, for 3 days before I ſaw her, ſhe cough'd and brought up a Viſcous Phlegm, ſuch as our Patients Vomit when their Stomachs are very foul; only as meer Phelgm is white, this was all of it as red as Blood, it was not ſtreak'd with Blood, or had a mixture of white Phlegm with it, but was ſo deeply colour'd, that it ſeem'd to be all Blood, only it would not flow as

Blood does whilſt it is hot; nor did it coagulate as Blood does when it is cold, but hung from the Baſons when it was pour'd out, as Vomited Phlegm does; and in this it differ'd from all the Bloody Expectorations I have ſeen, excepting Mr *Jones* at *Myn Heer Meyſters's* in *Kenſington*, who Cough'd the ſame Bloody colour'd Pituita, but in much leſs quantity, for Mrs *Terry* rais'd above a Pint in 24 hours, for ſome days, and tho a leſs yet a conſiderable quantity afterwards; Mrs *Terry's* afforded a very ſtrong ſmell, but Mr *Jones's* had no Odour. After ſome weeks ſhe recover'd, regain'd her Fleſh, which was waſted in her illneſs; the Menſes return'd, and ſhe continued very well from *July* till near *Chriſtmas*.

In *January* I was carried to ſee her at Mr *Wooleſton's*, the Queens-head Tavern at *Queen-hithe*, and ſhe gave this account of her ſelf.

That about 3 weeks before *Chriſtmas* ſhe perceiv'd her ſelf a little ſhort breath'd, which increas'd daily, with a fullneſs and weight in her Left ſide, that ſhe lay well on the Left ſide, but when ſhe turn'd to lye on her Right, ſhe felt as if a weight fell from the Left to the Right ſide, which gave her a ſhortneſs of Breath and made her Cough: Thus it continued increaſing till *Chriſtmas*, when ſhe began to raiſe a conſiderable quantity of ſtrong ſtinking Pus; ſhe ſaid ſhe eat her Victuals well enough all this time, and was not Feveriſh. At firſt ſhe was under the care of another Phyſician, who told her Relations when they deſired his judgment of the Diſeaſe, and its event, That it was an Ulcer in her Lungs, and he believ'd incurable, upon which they again committed her to my care. When I ſaw her, which was towards the middle of *January* 1701, ſhe raiſed a conſiderable quantity, and often of ſtinking offenſive Pus, which was as fluid as the Pus of other parts; her Fleſh was a little abated, but ſhe was at no time Feveriſh, ſhe eat and ſlept pretty well, and had the Catamenia duly. I preſcribed ſuch Medicines, as abated that Purulent Expectoration ſeveral times, and ſhe often gave me hopes of her Recovery, ſhe continuing to have the Menſes regularly, and being ſtill free from an Hectick, but upon every little Cold, ſhe again raiſed that fetid Pus in a conſiderable quantity. She generally continued pretty free from Coughing ſeveral hours together, till ſhe perceiv'd ſomething of a fullneſs in her Breaſt, which would oblige her to Cough, and after ſhe had once began to raiſe ſhe could not ceaſe, till ſhe had brought up two Spoonfuls or more of that fetid Pus. This ſhe did chiefly in the Morning, Afternoon and at Night; I did apprehend ſhe had an abſceſs in the Left Lobe of her Lungs, and made her lye upon the Bed, with her head reaching to the Chamber Floor, leaning upon her Left Arm. In this poſture ſhe could at any time, after a little Cough, ſet the Pus a running out of her Mouth, as you have ſeen ſeveral times, till the whole which was therein contain'd was diſcharg'd.

Then ſhe would get up, and ſeem to be as well as another perſon, till it was almoſt fill'd again. In the beginning of *May* laſt, thoſe Excellent Phyſicians, Dr *Torleſſe* and Dr *Pitts* favour'd me with their kind aſſiſtance. They ſaw her lye in the poſture I have deſcrib'd, and ſaw more than 2 ſpoonfuls of ſtinking Pus or Corruption run out of her Mouth, after a little Coughing. This made it ſo apparent that there was an Ulcer in her Lungs, that they immediately approv'd of what I had before propoſed to her and her Relations, of the neceſſity of making an Apertition in her ſide, where we could apprehend the Lungs grew to it, for that ſeem'd unqueſtionable, from the poſture of diſcharging it; and ſome little pain ſhe felt in her ſide. The great opinion her Relations juſtly entertain'd of theſe Gentlemen, being not only Men of great Learning, particularly in their own Profeſſion, but alſo of many years Practice, Dr *Torleſſe* having been almoſt 30 years ſince, choſen Phyſician to St *Thomas*'s Hoſpital, and Dr *Pitts* to St *Bartholomews* ſeveral years ago, made them readily conſent to what was propoſed, and deſire your aſſiſtance, being no Strangers to your great Ability both in Anatomy and Surgery. About a week before, the Pus had begun again to encreaſe, and the day before theſe Gentlemen ſaw her ſhe was taken in the afternoon with a chilneſs, after which her Pulſe became a little quicker, and ſhe a little Feveriſh, as I believe you remember ſhe was, when you applied the Cauſtick; this Feveriſh ſtate encreaſed every day, and after ſome days a Raſh appear'd, which laſted about 14 days before it was quite got off, and left her in a Hectick, with redneſs in her Cheeks towards evening, Night Sweats, continual Looſeneſs, extreme waſting of her Fleſh, and at length a ſwelling in her Legs, though ſhe kept her Bed. I doubt not but you remember that we felt ſome little knots betwixt the ſeventh and eighth Rib, which with other circumſtances made us conclude the adheſion was in that part, and would have laid the Cauſtick there, but that it would certainly have ſpread to the Glands of her Left Breaſt, which made us lay it between the ſixth and ſeventh Rib, (*ſurſum numerando*); As ſoon as you could you took it off, and with your Knife gently paſs'd through into the Cavity of her Breaſt, whence iſſued a Bloodyiſh Water, but no Pus; by bending your Probe you found the adheſion reach to the lower edge of the 7th Rib, and before the Eſchar was ſeparated, the Pus began to flow at every dreſſing, and ſo continued, gradually abating, till the Ulcer was cured; during which a part of the inſide of that Rib, above an inch long exfoliated, and after that another leſſer piece of the outſide of the Rib. Towards the latter end of the Cure, ſhe complained very much of a pain at the *Cartilago Enſiformis*, ſo great that ſhe ſometimes pluck'd out the hollow Tent, which we conceiv'd was occaſioned by its preſſing upon the Nerve, during the firſt 7 or 8 days of her Raſh, ſhe rais'd very little, if any, of that Pus, nor did it diſcharge its ſelf then by the Orifice, nor was there a collection of it in her Breaſt, which made me apprehend, that the Fever did ſo alter the ſtate of her Blood, as not to permit it, to ſeparate its impurities into the Abſceſs. I muſt obſerve to you, that for ſix days before the Fever began, ſhe had the *Cartemenia* very orderly; by *Auguſt* ſhe was cured, her ſide heal'd up, and would not endure it to be converted into an Iſſue; by *October* ſhe recovered her Fleſh, and the *Catamenia* return'd, which had been wanting ever ſince *May*, and now, as you lately ſaw her, ſhe is plump, fleſhy, clear and freſh Complexioned, has little or no Cough, and no fœtid or tabid expectoration, and ſeems, and I believe is perfectly cured, having for many months taken no Medicine.

There are ſeveral circumſtances in this Caſe, which I cannot forbear making ſome remarks on.

That there was an Ulcer in the Lungs, and that it has admitted of a Cure, contrary to the general opinion of Phyſicians. That this Ulcer did contain at leaſt 2 ſpoonfuls, and muſt have been as large as a Hens Egg. That this Abſceſs aroſe from a collection, with an indiſcenable (if any) Fever, and ſo continued from *Chriſtmas* to about the 10th of *May*. The tender Membranous or Veſiculary compoſition of the Lungs ſeem to juſtifie this opinion, that it is almoſt impoſſible for them to heal, when there is a conſiderable diminution of them, the continual and indiſpenſable neceſſity of their motion, very much hindring the coalition of the *Veſiculæ*.

Several parts of the Body afford a proper cement to unite and repair them, when hurt or diminiſh'd. Carious and broken Bones ſend forth a *Callus*; when the Skin is conſum'd by Ulcers or Burns the parts afford a Cicatrix, which pretty well ſupplies the defect of the Skin. The Lungs ſeparate a viſcid Pituita, which will be expanded into Fleaks like a Membrane; Mr *Stringer*, *Sarah Deeping* and ſome other Patients have brought up great quantities of them, and a little Boy at Mr *Tolley*'s in *Kenſington*, Cough'd up ſeveral Pipes, form'd exactly like the *Bronchia*, and its divarications, and at firſt view ſeem'd to be the internal Membrane. Mr *Buſiere* mentions this inſtance in the Philoſophiſophical Tranſactions, *April* 1700. His haſte would not permit him to obſerve the Caſe ſo exactly as it deſerv'd: this Child two years before, had an Ulcer in the Right ſide of his Lungs, and they adhered to his Back, when I ſeparated them I found a Cicatrix near three inches long, but very little (if any)defect in his Lungs,I am of opinion this Pituita or Mucus doth ſerve to re-unite the parts of the Lungs when there is a ſolution by an Ulcer.

Conſumptive Perſons generally flatter themſelves, that they have no Ulcer in their Lungs, becauſe they do not feel a ſoreneſs, as in the Ulcers of other parts. This opinion keeps them from making a timely application to Phyſicians, whilſt they might recieve a ſpeedy and eaſie Cure. When you touch'd the Sound or Ulcerated parts of her Lungs with your Probe or Finger, ſhe diſcovered no ſenſe of feeling you, which may confirm the opinion of Phyſicians and Anatomiſts, that the Lungs have little if any ſenſation. When you touch'd her Heart with your Finger, tho' I believe for not the twentieth part of a minute, ſhe grew very much diſordered, pale and ready to faint, which ſhows Nature cannot ſuffer the leaſt alteration in its pulſation, without great prejudice and inconveniency.

It is the opinion of ſome Phyſicians,that the Fever which attends Conſumptive Patients, ariſes from ſome Particles of the Pus, which being receiv'd into the Blood, and circulating with it, cauſe that efferveſcence which we call an Hectick. This Patient had no Fever from *Chriſtmas* to *May*, and then unhappily came a continued Fever, with a Raſh, which left a Febricitation every afternoon, with thoſe ſymptoms which attend a Hectick.

I have obſerved for many years, that if I could preſerve my Conſumptive Patients from that Hectick Fever, or relieved them who already labour'd under it, I could cure them, tho their expectoration was very plentiful and foul. I doubt not, but if ſome of our faculty applied themſelves more particularly to the cure of Conſumptions, ſo many thouſands would not dye of it yearly in this City, as appears by the Bills of Mortality.

I do not doubt but ſome part of her Lungs do adhere to her ſide, and it's probable a little part of them do not receive the Air in inſpiration, but I believe that defect is very inconſiderable, becauſe ſhe can run up Stairs, and is no more diſordered in her Breath than moſt other People.

The eaſy diſcharge of the Pus, by her lying down in that poſture, did undoubtedly very much preſerve her Lungs, and prevented its breaking through the Abſceſs, into the Cavity of her Breaſt, and putrifying her Lungs to a greater degree. *Pus*, generat *Pus* is a noted Aphoriſm, and the Air Bladders of the Lungs are ſo very tender, that they muſt have yielded to the preſſure of the Pus, had it lain long in the Abſceſs, and been only diſcharg'd by violent Coughing; by lying in a proper poſture. Sir *Tho. Proby*, *Sarah Deeping*, and other perſons have prevented a greater ſolution in their Lungs, and either prolong'd their Lives many years, or recovered their Healths by proper Medicines.

This and other inſtances, make me eaſily concur with ſome Phyſicians in an Opinion, that in ſome Families the Lungs have originally a more tender Conſtitution than in others. Mrs *Terry's* Aunts are ſubject to great Coughs and Ptyſick. Her Aunt *Fowkes* little Daughter of about 7 years old, having a little Fever, with ſome ſymptoms of the Small Pox, but a great difficulty in Breathing, I adviſed her Bleeding at the Arm, but ſhe was ſo fat you could not find a Vein that night; next day the Small Pox appear'd, which a little eas'd her Lungs, upon the ſixth night after, ſhe rais'd at ſeveral times about 7 or 8 Ounces of clear Blood, by violent Coughing: I was ſent for, and drew away about 6 Ounces of Blood by Leeches, which totally reliev'd her Breath, and ſtopp'd the raiſing Blood. This inſtance I mention being ſo like Mrs *Terry's*, to confirm what I ſaid before, and to evince that ſo great loſs of Blood will not hinder the regular proceeding of the Small Pox, which ſhe went through very orderly, and recovered perfectly. I have obſerv'd the ſame effect in other Patients, in whom Bleeding after eruption was indiſpenſable.

The continual motion of the Breaſt in Breathing, made the Cauſtick ſpread farther than it was deſign'd, or could be prevented; I have prevail'd with ſome Patients to yield to an apertion by Launcet, which I take (in ſome Caſes) to be the better way; that little Blood which may poſſibly get into the Cavity of the Breaſt, is eaſily thrown out again by the Lungs in inſpiration, as you may remember ſhe did the injection every time you uſed it.

You cannot forget how after the *Pus* began to flow at the Orifice, it leſſen'd the raiſing it at her Mouth, and in no long time, the Purulent Expectoration totally ceas'd.

SIR,

This Letter already exceeds its proper bounds, therefore I will omit ſome other remarks of leſs conſequence, *viz.* on the Bloody Colour'd *Pituita*, the Fetid Odor of the *Pus*, and the Raſh Fever which came without any manifeſt cauſe, and only Subſcribe my ſelf,

Your moſt Affectionate Friend

And Servant,

Jo. Wright.

II. *An Anſwer to Dr* Wright's *Letter, concerning the Cure of an Apoſthumation of the Lungs, by* William Cowper, *F. R. S.*

SIR,

HAd we more ſuch Communications as you are pleaſed to favour us with, the Publick as well as my ſelf would have reaſon to be thankful. *Obſervations* unqueſtionably are the beſt Charts in Medicinal Practice; but *they* muſt like *yours* be genuine, and not fram'd in favour of any Hypotheſis; when the Relator too often, not only conceals Truth, but is inclinable to add ſomething in favour of his Conjectures.

Nothing occurs to me ſo remarkable that you have omitted in relating Mr. *Terry's* caſe, as your Prognoſtick of her recovery, which indeed you ſeem induſtriouſly to avoid, when it muſt be your own obſervations in ſuch difficult caſes that made you Maſter of the conſequence, which I cannot forbear putting you in mind of, when you ſo often encouraged me to expect ſucceſs in her caſe, that was genenerally lookt upon as deplorable. You may remember, that the Matter or *Pus* which firſt flowed from her ſide was ſo offenſive in its ſcent, as obliged the By-ſtanders to quit the Chamber, inſomuch that the Nurſe uſually at the time of dreſſing and afterwards, was wont to burn Roſemary, *&c.* to ſuppreſs the Stench. So putrid was the *Pus* that it tarniſhed that end of the Silver Probe I paſt into the cavity of the Abſceſs, as it did the top of a Silver Syringe in making Injections. There ſeems no room to doubt that the *Pus* which then flowed from her ſide came from the ſame cavity ty the *Pus* did ſhe before Coughed up, when the Liquor that was Injected at her ſide came into her Mouth ; which ſhe frequently complained of, and particularly of the bitteriſh taſte of the Tincture of Myrrhe I ſometimes uſed in the Injections.

Among the many Diſaffections of the parts of Humane Bodies, the Diſeaſes of the Lungs have been lookt on as none of the leaſt dangerous : And indeed if Obſervations did not aſſure us of the poſſibility of ſucceſs, the commonly known ſtructure of the Lungs would afford us but mean Arguments for the ſhift Nature makes, in the Inſtance you have given ſo exact a Deſcription of, as well as ſome other Inſtances of the like Nature I have met with.

About two or three years ſince, I ſaw a Boy in the ninth or tenth year of his Age, who (ſome time before) after a Continu'd Fever was purſu'd with an Intermitting one ; a Cough follow'd, in which he brought up (at ſhort intervals) no ſmall quantity of thick purulent ſtinking *Pus*, which diſcharge (I think) continued on him not leſs than fourteen or fifteen months before I ſaw him : His Phyſicians order'd him Iſſues in his Back, which I made as uſual : He had then a healthy Aſpect, his Cheeks florid, and was very brisk and active : When he juſt came from play he was bid to take a Baſon in his Hand and Cough as he was wont, which he did, wherein I ſaw him diſcharge at his Mouth not leſs than 4 or 5 Ounces of the ſort of *Pus* above-mentioned : This his Mother told me he had been wont to do twice every day ; nor did he appear any ways diſordered after, but return'd to play immediately. His Phyſicians ſent him into the Country whence he came, where in about a twelvemonth I heard he dyed, but was not acquainted with his circumſtances after : What ſucceſs the operation we practiſed on Mrs *Terry* would have had on this Boy, I dare not determine ; tho I cannot but think it might have been ſafely done to him and another Patient I was ſince call'd to, but I could not obtain the conſent of the Phyſician that was conſulted.

Another inſtance (in which a conſiderable part of the Lungs was obſtructed, and conſequently became uſeleſs, ſome time before death) was in a Girl of ſixteen, who had been Scrophulous not leſs than 9 years; the Glands about her Neck and Throat being very much indurated as well as diſtended, her Lips and Noſe were alſo ſwoln: About a year and a half before her death ſhe Coughed up ſeven or eight ounces of fœtid *Pus*, in leſs than 24 hours. On changing the Air of this Town for that of the Country, together with the uſe of Balſamick Pectorals, ſhe recover'd a healthful appearance in her face; but continued ſomewhat Aſthmatick. On taking cold (as 'tis call'd) her Appetite as well as Digeſtion fail'd her, ſhe grew Feveriſh, and dyed after a few days indiſpoſition.

On opening the *Thorax*, I found the Lungs cleaving to the *Pleura* of the Left ſide, in ſuch manner that they could not be ſeparated, without one of thoſe parts borrowing from the other. A portion of one of the Left *Lobes* of the Lungs being cut off, ſunk in Water; from which part 'twas likely the Matter came which ſhe formerly Coughed up, tho the Ulcer was then cloſed, and no appearance of Matter was to be ſeen in that or any other part of the Lungs. The Lymphatick Glands at the divarecation of the Windpipe had by their Intumeſcens ſo compreſt the Canal of the Left ſide, that it wanted more than two thirds of its proper paſſage for the Air.

In theſe, and ſome other Inſtances I could produce, it's evident that conſiderable parts of the Lungs may be Obſtructed, and the perſon ſurvive; but Mr *Terry*'s Caſe demonſtrates the Poſſibility of their recovery when part of their Lungs are totally Obſtructed, as muſt happen in ſuch large Abſceſſes. But how the remaining ſound parts of ſuch diſeas'd Lungs become capable of tranſmitting the whole Maſs of Blood from the Right Ventricle of the Heart to the Left, in equal time and quantity with the Blood that Circulates in the reſt of the parts, ſeems not eaſily accounted for, when indeed it exacts our wonder that it is done in a Natural ſtate, when all the paſſages of the Lungs are open and free. Since I had often found Water, injected by the *Arteria Pulmonalis*, return readily from the Lungs again by the *Vena Pulmonalis*, I was tempted to try if melted Wax, when very hot, would not do the like; Which ſucceeded in two young Cats Lungs: for after Injecting the Wax (mixt with Oyl of Turpentine, and tinged with Vermillion) by the *Arteria Pulmonalis*, I found it had fill'd the Pulmonick Vein with the Left Auricle, inſomuch that ſome of the Wax had reacht the Left Ventricle of the Heart: I don't remember this Experiment ſucceeded, but that ſome of the Wax was extravaſated, and came into the *Broncheæ* and Wind-pipe at the ſame time.

In preparing a Human Heart, by filling its Ventricles, Auricles and Trunks of its large Blood Veſſels with Wax, I found on Injecting the Pulmonick Arteries and Veins with Wax differently tinged, that the Wax paſt from the Veins to the Arteries without coming into the *Broncheæ*, or being extravas'd, tho the Wax was not Injected with near ſo much force as might be. I muſt confeſs I was never ſo fortunate to make Wax paſs from the Arteries to the Veins in Human Bodies or Quadrupeds, unleſs in their Lungs, as above noted, and the *Spleen* and *Penis*; Nor do I remember it has happen'd in thoſe parts, but when the Wax has been impell'd with great force, tho I have conſtantly obſerv'd the Communication of Arteries and Veins of the *Spleen* and *Penis* more open than in other parts except the Lungs. I wiſh Dr * *Morland* had told us in what part of the Human Body Dr *Areskin* had made Wax paſs from the Arteries to the Veins, ſo as to demonſtrate their Continuation to the Naked Eye, becauſe I have hitherto found the Naked Eye unable to diſcover the Extremities of the Arteries and Veins, when the Blood it ſelf was moving in them, in the tranſparent parts of the

* Phil Tranſact. No 283. pag. 1292.

Omentum or *Meſentery* of Quadrupeds, or in the Lungs of Frogs or Lizards when living; or after death when the Blood has been retain'd in their Lungs in the following manner. On making Inciſion into the Bodies of theſe Creatures their Lungs will ſtart out, and be diſtended with Inſpired Air; on which, make what haſte you can to paſs a Ligature (*i. e.* a Waxt Thread) and tye it firmly toward the upper part of the Lobe, as near the Heart as you can: When the Lungs of Frogs and Lizards are dryed, thus diſtended, you may examine them with your * Microſcope, and they will appear as repreſented Fig. 1ſt, 3d, 4th, 5th and 6th. The firſt and ſecond Figures ſhew the difference in the magnitude of the extremities of the Veins and Arteries of the Lungs, and thoſe of the foot of a Frog view'd with the ſame Microſcope.

Hence it appears that the Communications between the Arteries and Veins of the Lungs are more open than thoſe of other parts, at leaſt in the Feet of Frogs: And till it can be ſhewn that Melted Wax can be as eaſily injected from the Arteries to the Veins of other parts in a Humane Body and Quadrupeds, I ſhall be inclin'd to think the Communications between the Pulmonick Arteries and Veins in general are more open than the Arteries and Veins of other parts, except the *Spleen* and *Penis*.

This patent Communication of the Arteries with the Veins of the Lungs ſhews how thoſe Veſſels tranſmit the Blood in equal time and quantity with the Blood that moves in

* The Microſcope uſed in drawing the Figures is deſcribed and Figured Tranſact. No 281. The manner of applying the dry'd Lungs here mentioned, is thus, Take out the Glaſſes in the Slider or flat piece of Ivory, marked in the Fig. of that Tranſaction, e. e. f. f. and, paſt in the holes f. f. parts of the dry'd Lungs as mention'd, whether of Frogs, Toads, Snakes, Vipers, or the like Creatures, that have their Lungs Veſicated as well as Veſiculated; and by this means you may keep objects of the Lungs of thoſe Animals always by you; ſome of which I have had this three months, and are now as Beautiful as when firſt put in; only you are to remember to place the external ſmooth ſurface of the Lungs toward your Object Glaſs when you view it: In the ſame manner, the extremities of the Blood Veſſels of any Tranſparent parts of Animal Bodies may be examin'd by that Microſcope.

in the reſt of the Blood Veſſels of the whole Body in a healthful ſtate.

Hence it is, when any of the Blood Veſſels of the Lungs are ſtreightened or totally compreſt (either or both, which Circumſtances muſt happen in Mrs *Terry's* Caſe) the remaining unobſtructed Blood Veſſels are forced to diſcharge more than they were wont, and in time thoſe Veſſels become ſufficiently dilated to ſupply the defect. The like happens in the Communicant branches of the Arteries of any part, when ſome conſiderable Branch or Trunk is ty'd up, as in the operation for curing of an * Aneuriſm.

Thus, Sir, we find the ſtructure of the parts of Animal Bodies not only ſufficient to perform the ordinary operations of Nature, but their *Organs* are ſo wonderfully made, that notwithſtanding conſiderable parts of thoſe Organs are obſtructed, yet their neighbouring parts (as in the caſe before us, the Blood Veſſels) become capable of ſupplying the defect. This indeed exacts our gratitude as well as admiration of the Divine Architect.

* Vide Phil. Tranſact. No. 280. P. 1191. The Patient then mentioned is in perfect health and has recovered the intire uſe of his Arm.

The Explication of the Figures.

Fig. 1.

THat part of the 5th Figure at D . . . . . done by a larger Magnifying Glaſs, *i. e.* by the 3d Glaſs of the Microſcope deſcribed No 281. of theſe Tranſactions.

A The Arteries.

B The Veins of a Frogs Lungs prepared as above-mentioned.

C Their Inoſculations with each other.

D . . . . . The *Area* of the Microſcope, as it appears to the naked Eye.

Fig 2.

Part of the hinder foot of the young Frog viewed with the ſame Microſcope when living; whereby the different magnitude of the extremities of the Arteries and Veins of the Lungs in the firſt figure, and in this expreſt at C C is very evident; The former being capable of admitting at leaſt three Globules of Blood to paſs abreaſt, whereas the extremities of the Arteries and Veins in the Feet admit of one Globule of the Blood only to paſs before the other.

A A The Trunks of the Arteries.
B B Thoſe of the Veins lying by the ſide of the Toes.
C C Their Extremities continu'd with each other, in the tranſparent Membrane between the Frogs Toes.
a a Two of the Frog's Toes.

Fig 3. and 4.

The extremities of the Arteries and Veins of a Frog's Lungs, viewed with the 4th Glaſs of the ſame Microſcope, made by *James Wilſon.*

A A The Arteries.
B B The Veins.
C C Their conjunctions with each other.
D The *Area* of the Microſcope.

Fig 5.

One of the *Hexagon Areæ* of a Frog's Lungs, which were not ſo much diſtended by Inflation, as thoſe parts of the Lungs repreſented in the two former Figures 3. and 4, whereby the little *Areæ* or Cells in the Interſtices of the extremities of the Veins and Arteries appear cloſer and leſs than in the two foregoing Figures, tho viewed by the ſame Microſcope.

A The Arteries.
B The Veins.
D The *Area*, which is more magnified at Fig the 1ſt.

Fig 6.

The lower part of one of the Lobes of a Water Lizard's Lungs, as it appears by the Microſcope, when the Blood is retained in the extremities of the Veſſels, as in the preceeding Figures.

A A The Trunk of the Pulmonick Artery.
B B The Vein.
C C . . . Their Branches, joyning with each other.
D D The tranſparent ſmooth Membrane, which in this Creature, is not viſiculated, or full of Cells, as in the Lungs of Frogs, on which the Blood Veſſels are expanded ; nor does the Internal ſurface of this Membrane differ from the External, as in Frogs and divers amphibious Creatures. The Lungs of theſe Water Lizards being veſicated, and not veſiculated.

If, Sir, in this, the Publick or your ſelf meet with any ſatisfaction, I ſhall think the time well beſtowed, by

Your obliged

Humble Servant,

Wm Cowper.

III. *Georgij Joſephi Cameli* Obſervationes *de Avibus Philippenſibus*; *Communicatæ a Jacobo Petiver. S. R. S.*

1. ACcipiter *ordinarius.* Banog *Luzonenſibus* Gavilan *Hiſpanis.* Luteolus *in Dorſo & alis,* candidus *in Ventre.*

2. Accipiter *magnitudinis* Banog. Sicub Sicap, *vel* Lavin *Luzonenſib*: Fuſcus, vel etiam luteo, albo & nigro varius.

3. *Anas* parvula, lacuſtris, vix magnitudinis pugni.. *Saloyaſir* Luzon.

4. *Anas* magna Regia. *Papan* Luzon.

5. *Anas* domeſtica, cujus ova *Sinæ* ignis calore fovent, & excludunt. *Ytic* Luzon.

6. *Anas* lacuſtris ordinaria. *Balivis* Luzon.

7. Ardeola. *Garza* Hiſpan: *Dangcanghac* Luzon.

8. Ardeolæ *ſpecies* candiſſima. *Talabong* Luzon.

9. Aſio *Mochuelo* Hiſp.. *Manonoctoc* Luzon.

10. Avicula minima, varie picturata, *vivit* melleo florum rore. *Sivit.* Luz.

11. Avicula altera præcedenti major, ſpecies eſſe videtur *Alaudæ.*

12. *Avis* Auguralis *Balatiti* Luzon. *dicta.*

13. *Avis* Auguralis *Tigmamanucqin* Luzon. *dicta.*

14. Avis *Auguralis*, parva, varie picturata, roſtri magni & longi. *Salacſac* Luzon. *an* Peſcador *H. Martin.?*

15. *Avis* deſtruens *Orizam*, coloris *Perdicis*, ſed ſpecies *Ruſticolæ*, German. *Dchneppen.*

16. Bubo. *Buho* Hiſpan. Tigbobot *Luzon.*

17. Calao *vel* Cagao *Indorum*, Volucris & Montana eſt *Avis*, vivens fructibus *Baliti* ſ. Ficûs Ind. Sylv. *Pilis*, ſ. Amygdalo-Piſtaceis, Volvuli *Colyat*, & aliis, quos integros in-

gurgitat ; confecto verò cortice carnoſo, putamina oſſea illæſis nucleis egerit. Non eſt ſpecies *Xochitenacatl* Nirembergii p. 208. ſed diſtincta. *Corpus* Gallinæ ſuppar, ſed uſque ad alarum principium ſpithama longius, ad ventrem nigrum, uropigium verſùs paleare, ad dorſum cinereo fuſcum : *Collum* ſpithameum unâ cum capite ruffum : *Caput* parvum ad oculos nigrum ; *Oculorum* pupillæ cæſiæ, albâ iride, in palpebra utraque cilia nigra, ſetacea, digitum auricularem tranſverſum longa : *Roſtrum* ſpithameè hians ſubincurvum, ſerratum, diaphanum, coloris cinabarini ; parte inferiore longitudine compar ſuperiori, ad medium ſeſquiunciam latum ; parte ſuperiore palmam altum, ſpithamâ longius, & ſuperne planâ, ſpithameâ, & fere palmam lata caſſide galeatum : *Lingua* pro tanto roſtro exigua, vix uncialis : *Vox* Suis grunnientis potius, aut Vituli mugientis quam Avis. *Fæmora* una cum *tibiis* ſpithamea luteſcant : *Pedes* antrorſum tribus, retrorſum uno digito, digitali ſquammati, rubentes, unguibus nigris ſolidis aduncis hamantur : Caudam conſtituunt 8 majores, cubitales, candide pennæ : Alarum quamlibet 15 aut 17 majores fere cubitales, & fulvæ remiges pennæ : *Calao* Gentiles ſuperſtitioſe colunt, & obſervant, fabulantur cum Grue *Tipul* ſ. *Tihol* pactaſſe, ut hæc paluſtribus *Calao* ſylvoſis contenta viverent hinc *Tipol* ſi ligno quocunque inſederit, in pænam tranſgreſſi fœderis ſeſe loco movere non valere, e contra *Calao* ſi aquoſis & humilibus. Vid. *Fig.* in *Gazophylac.* Naturæ & Artis *Decad.* 3. Tab. 28.

Niremb. l. 10. p. 208. c. 8.

Gaz Nat. & Art. Tab. 28. Fig.

18. Roſtrum aſſervo *Calao* aliud, præter primum quod deſcripſi, eſt autem pars ſuperior, ſpithameum, nigrum & caſſide fornicatâ galeatum; apice tantum rubente. *Icon* ejus exhibetur in *Decad.* iv. Gazophyl. *Nat.* & *Artis.* Tab. xxxi.

Gaz. N & A. Tab. 31. Fig

19. Chloropus, T. *Acbac* Luzon. *aliis* Ticlin *major.* Avis eſt *magnitudine* Gallinæ, *Venter* & *Collum* & *Pectus* coloris quaſi dilute morella, *Dorſum* fuſce-rufeſcens, *Alæ* ſplendide cæruleovirentes, *Cauda* curta albida, tremula : *Oculi* nigri, *Roſtrum* nigrum, validum, obtuſum, *Linguæ* Gallinæ, *Pedes*

ſpithamei, tetradactili, ruffeſcentes; Ungues nigri, *Digiti* longi. *Degit* locis cultis, *veſcitque* Oriza. *Vox* Phi. Phi.

20. Cignus. *Cizne* Hiſp. Tagac *Luzon.*

21. *Columba* domeſtica. *Palapati* Luzon.

22. Columba *Perſica* in *Luzone* vocata. Corporis mole minor eſt communi, communiter candidiſſima, caudem pandens & explicans in radium ut *Pavo.*

23. *Columbæ ſimilis*, Avis Maritima. Canavay *Luzon.* Ova ſupra nudas caules ponens & ibidem iis incumbens. *an* Alcion. ?

24. Corvus *Europæo* minor. *Guac* Luzon.

25. *Corvus* fluviatilis. *Caſſili* vel *Colocolo* Luzon. Avis eſt amphibia, plus temporis ſub aquis, quam in aere vivens, niger, colli longiſſimi, victitans *Piſcibus*, *Serpentibus* & *Conchyliis*, ſub undis diutiſſime diſcurrens, & tandem expanſis alis, pennas ad ſolem deſiccans.

26. Coturnix *Europeâ* minor. *Oloc* vel *Pogo.* Luzon.

27. *Coturnix* pumila montana, *Paſſere* minor, varie picturata. *Ilivilin.* Luzon.

28. *Gallinæ* ſimilis *Avis.* Acbab *Luzon.*

29. *Lapillum*, ſimilem *viliori Perlæ* vidi apud *Alphonſum Eſtaplau*, Gallinæ exemptum, proliferum.

30. Gaviæ ſpecies. *Gaviota* Hiſp. *Ggitgit* Luzon.

31. Gavia *Gallina* minor, coloris cinerei. *Tambilagan* Luz.

32. *Gavia* viviſſima, velociſſime per littora diſcurrens. *Taringting* Luzon.

33. Grus. *Grulla* Hiſp. *Tipul* vel *Tihol* Luzon. Tricubitum alta, cum *Collo* homine procerior.

34. Gruis *ſpecies.* Dongon *Luzon.* Magnitudinis Anſeris, cinerea, *roſtro* ſeſquiſpithamam longo, palmo latum.

35. *Hirundo* ordinaria. *Layanglayang* Luzon.

36. *Hirundo* maritima. *Salamga*, alijs *Sayau*, *Botabota* & *Salangan* Luzon. Cujus *Nidus* eſt *Tragacanthum Venereum Indicum.* Nidus Avium *Schroderi* Patong *Indorum.* Enno *Sinarum.* Abundat in Inſula *Jolo. Samboangan.*

37. *Merula Perſica.* Canora & garrula avis, atra, ſed circa oculos depilis ut *Illing*, minus tamen.

38. Noctua. *Lechuza* Hiſp. *Covago* Luzon.

39. *Noctua* major, magnitudinis Gallo-pavonis. *Bucao* Luzon.

40. Onocrotalus, s. Pelecanus, *Alcatraz* Hiſp. *Pagala Indis.* Pectoris pellem, ſuaviſſimis plumis conſitam pro pectorali geſtatam, Aſtmaticis prodeſſe referunt.

41. Oropendula *Hiſp.* Guliyavan *Luzon.* Gratioſa & pulcherrima eſt Avis, magnitudine *Turturis*, victitans fructibus, atris & aureis variegata plumis.

42. *Palalaca* Luzon. *Herrero* Hiſp. i. e. *Faber ferrarius.* Avis ſimilis eſt *Upupæ*, Vocis craſſæ & raucæ, *Caput* habet ſpadiceum, criſta ornatum, *Roſtrum* quaſi ferreum, quo pro nido parando arbores ligni duriſſimi excavat, quas ictu magno percutit, ita ut repercuſſionis ſonus longiſſime, ad 300 paſſus percipiatur; *Corpus* magnitudinis *Gallinæ* mediocris, coloris viridis, alii variegatum dicunt. Hanc narrant noſſe Plantam ferrum emollientem.

43. *Palalacæ* ſpecies. *Iting*, *Tabaduru*, vel *Gulin* Luzon. *Magnitudinis* ſturni, *Roſtrum*, *Alæ*, *Cauda* & *Pedes* nigra ſunt, reliqua quaſi argentea, *Caput* implume, excurrente tantùm per ejus medium tenui, nigra, & plumoſa ſtria: *Nidulatur* communiter in excavatis Palmæ Cocciferæ caudicibus. Voraciſſima eſt, vivens Fructibus, hinc non niſi unicum & rectum inteſtinum vulgus habere narrat. De reliquo canora & garriens eſt Avis.

44. *Palumpes*, varie picturata, formoſa & ſuperba. *Bayo* Luzon.

45. *Paſſer Solitarius.* Magnitudinis eſt *Turdi*, coloris fulvi mas, fæmella ex nigro & fuſco varia. Canora eſt Avis ut *Phylomela*, vivens Inſectis.

46. *Paſſerculus* vivens *Oriza.* Maya *Luzon.*

47. Paſſerculus *Maya* minor, verſicolor, vivens ſemine Graminis *Nemelen.* Pacquing *Luzon.*

48. *Paſſerculus* præcedenti compar vivens ſemine *Phalaridis* minoris. *Pirit* Luzon.

49. *Paſſerculus* priori ſimilis. *Poſicqit.* Luzon.

50. *Paſſerculus* præcedenti minor. *Pipit* Luzon.

51. *Pſittacus* minimus *Cluſii* Exot. 365. Fig. *Gulaſiſi, Colaſiſi* vel *Cuſi.* Luzon.

52. *Pſittacus* duplo major priore, totus viridis, roſtro valde lato, & nigro, pedibus coloris cinerei indocilis. *Quilaquil* Luzon.

53. *Pſittacus* totus candidus, criſtatus, magnitudinis *Columbæ*, cicut evadit, & garrire ſolet. *Catatua, Abucay*, vel *Calangay* Luzon.

54. *Pſittacus* cœruleus. *Bototoc* Luzon.

55. *Pſittacus* variis picturatus coloribus. Manucmanuc Luz.

56. *Pſittacus* viridis mediocris. *Cagit* Luzon.

57. *Pſittacus* viridis maximus. *Cqilacqil* Luzon.

58. *Pſittacus* viridis magnitudinis *Abucay.* Anſig. *Luzon.*

59. *Pſittacus* clare virens, capite rubente, minor *Anſig.* Inſag. *Luzon.*

60. *Pſittacus* candidus, *Gallinæ* compar, roſtrum, lingua & pedes nigra: loquax & reliquis diſtinctius garriens. *Catatua* altera major.

61. Sturnus *Luzonis*, Corvorum inimicus, coloris aterrimi, ſeu fulvi ut Aquila, ad ſolem mille induens colores; Oculi corallio nitidiores, pedes flaventes, viviſſimus, vivens fructibus. *Gulacling* Luzon.

62. Sturnus *Sinenſis*, niger, oculi, roſtrum & pedes flavi, cicur, canora, & garriens avis. Veſcitur Pane, Oriza, Inſectis, carnibus, fructibus. *Kaaling* Sinarum.

Hern. 56. c. 220. *Jonſt* Avium 119. Nieremb.

63. Tabon *Luzon.* Daic *Hernaud.* Hiſt. Avium p. 56. c. 220. Daie *Jonſt.* de Avibus 119. Avis ovimagna *Nieremb.* l. 10. c. 5. p. 207. Avis ovimagna *Daie* dicta *Ray* Ornith. app. 297. *id.* Angl. 385.

Avis ſubfuſca vel etiam cinerea, minor communi *Gallina*, cauda carens, capite rarenter plumato, carnis inſulſæ nec apeteſcibilis. Ova ponens ruffa, Anſerinis longitudine paria, ſed minus craſſa, No 40, 50 & 60 in maritimis arenoſis, littoribus, fluviorum ripis, aut etiam montium locis glareoſis, quatuor ſpithamis profunde ſepulta, ſolis calore fovenda, quæ ferme in totum vitellina ſunt, boni ſaporis & nutrimenti. Pulli in Ovis ſapidiſſimi, ovo egreſſi inſipidi.

Ray Ornith. 297. *id.* Angl. 385.

64. *Tetrax.*

65. *Tinunculi* ſpecies. Similis *Sicub* ſed minor. *Baltiſicap* Luz.

66. *Turtur* ordinaria. Batobato T. . Tocmol Baynenſibus.

67. Turtur *Luzon.* Fæmella in pectore plumas gerit Roſei coloris ſeu Sanguinei floridiſſimi, vulneris inflicti imaginem pereleganter a natura depictam ad vivum repreſentantes, ſauciatam eſſe diceres, & plures fefellit. Pelicanum fabuloſum putares. *Lugmon* Luzon.

68. Turtur *Luzon.* viridis ut Pſittacus, Alarum pennæ majores margine ſignantur candido, imus Venter & croceo rubeſcit, roſtrum flavum eſt, oculi cinabarini pedes purpuraſcentes, Victitat *Oriza.* Punay *Luzon.*

69. *Turtur* Baynenſis, *Lugmonio* & *Panayo* major eſt, coloris inter flavum & viridem medii, caudæ & alarum pennæ majores nitide flavo & aterrimo virgatæ ſunt, alarum principium fulvum, oculi coloris viridis æris, roſtrum & pedes dilute cærulei, uti & criſtæ locus. Vivit fructibus.

70. *Ulula* Magna. *Tigcalo* vel *Tigbabayo.* Luzon.

71. Urogallus ſeu Tetrao. *Labuyio* Luzon.

IV. *A Letter from Dr* William Oliver *to the Publiſher, giving his Remarks in a late Journey into* Denmark *and* Holland.

THe Colleges and Schools in *Copenhagen*, both as to their Structure and Foundations, are very ordinary: The beſt I ſaw there was the Gift of the Learned *Borichius*, and conſiſts of twelve Apartments for as many Students, which are conveniently provided with Stoves for their manner of living in that cold Country. There is in it a ſmall School for publick Exerciſes, and a little Library belonging to their Colledge; the reſt of the Students, except one hundred maintained by the King in ſmall Colleges, live at Lodgings in the City, as at *Leyden* and other Univerſities abroad, who when the *Swedes* threaten'd them with a Bombardment in the year 1700, formed themſelves into a Batallion, and did Duty there, all the while the Enemy was on the Iſland of *Zealand*. There are in this Univerſity, erected about two hundred years ago, about a thouſand Students, and ſometimes they have had near fifteen hundred.

The Univerſity Library, over one of their Churches, in one large Room, conſiſts of ſeveral Libraries, the Gift of particular men which are kept apart, with the Benefactors names over them in Capital Letters. The Royal Library, belonging to the King, conſiſts of a great variety of Books, well condition'd and well choſen, of all Languages; the Books of each Country being placed by themſelves: The Room is large and well built, and has a large Gallery ſupported by Pillars on each ſide. If *Gudius*'s Library at *Gluckſtadt* be added to this, as I was told it wou'd, this Library may be reckon'd of the firſt Rank of the *Europæan* Libraries.

The Kings Chambers of Rarities are in all eight, large and well built over the Royal Library : They are furniſhed with great variety of Natural and Artificial Curioſities. The firſt contains Coins and Medals, Gold and Silver ; Modern and Antique ; *Græcian*, *Roman*, *Daniſh* and *Oldenburgh* ; beſides other *Europæan* Nations, diſtinctly kept by themſelves, which make altogether a very valuable Collection. Amongſt the Natural Curioſities which are in the other Chambers, the moſt remarkable are ;

1. The Petrified Child : This is the ſame Child that *Bartholine* makes mention of in his *Hiſt. Anat. Paræus*, *Licetus de Monſtris*, *&c.* who at large will acquaint you with the Hiſtory. This happen'd at *Sens* in *Champaign*, *anno* 1582. when it was Cut out of its Mother's Belly, where it was ſuppoſed to have lain about eight and twenty years.

That it's an Humane *Fœtus*, and not Artificial, is viſible to our Eye. The upper part of it is of a Gypſeous Nature, not ſo hard as the lower, the Thighs and Buttocks being hard and perfect Stone as can be, of a Red Colour, and of a Grain and Superfice exactly like thoſe I have ſeen taken out of the Bladder. I had the Curioſity to have it near me ; and touch'd and felt it all over. This was convey'd firſt to *Paris*, and there bought by a Goldſmith of *Venice* ; from whom at *Venice*, *Frederick* the Third, King of *Denmark*, purchas'd it, and added it to his Rarities.

2. Two Elephants Teeth, that weigh an hundred and fifty pounds apiece.

3. Several Heads of Hares, with divers ſort of Horns, brought out of *Saxony*.

4. An Egg, ſaid to be laid by a Woman, of the ordinary ſize of a Pullets Egg. This *Ol. Wormius* tells us was ſent him by very good hands, and Confirm'd by people of Credit : He tells us, the Woman brought forth two, with

the uſual Child-bed-labour Pains; her Neighbours being call'd in to her aſſiſtance, the firſt they broke, and found a Yolk and a White, as in that of a Hen; the ſecond was kept and ſent to him. *Vid. Muſ. Worm. p. M.* 312. *Jo. Rhod. Cent.* 3, *obſ.* 57.

5. The Horn of a Sea Unicorn, or *Monoceros*, ſo called by the Learned, becauſe ſuppoſed to have but one: But ſometimes more are found to grow out of the upper Jaw; and I was credibly informed at *Copenhagen*, that one *Koens*, a *Hamburger*, brought home from *Greenland* the Head of one of theſe with two Horns on it. And when I ſaw this, and Examin'd it well, I found this Horn (part of the Head and upper Jaw being brought home with it,) not to grow out of the Middle, but Left ſide of the upper Jaw; ſo that 'tis probable there was a fellow, and then they may be ſaid more properly to be his Teeth or Tusks than his Horns: Whither this was only a *Luſus Naturæ* or no, or naturally theſe carry only one Horn, as they are repreſented in the Cuts and Figures our Naturaliſts give us of them, I ſhall not determine.

6. Several pieces of Gold Oar very rich, and ſome almoſt fine, dug out of the Mines of *Norway* and *Hungary*.

7. Several large pieces of Silver Oar, dug alſo out of the Mines of *Norway*, one of which weigh'd five hundred and ſixty pounds, *anno* 1666, five foot and ſix inches long, and four foot about, valued at five thouſand Crowns: Another from *Norway*, alſo valued at three thouſand two hundred ſeventy two Crowns. I obſerv'd a great many Silver Threads or Trees ſprouting out of theſe two pieces, and fancy the whole Maſs had not above a fourth part of any baſer Metal, Mineral or Earth mixt with it: There are ſeveral of theſe Silver Ramifications or Trees, all from *Norway*, which I take to be Virgin Silver and pure Metal.

8. A great variety of very large pieces of Amber; ſome dug out of the Iſland of *Anaker* near *Copenhagen*, and ſome when they were opening the Ditches for the Fortifications

of *Copenhagen:* Some of theſe weigh about forty or fifty ounces, and were found every where ſticking faſt to pieces of black Timber like Ebony. Whither Amber be of the Vegetable or Mineral Kingdom, wou'd be too long a diſpute at preſent to be determin'd; all I ſhall ſay at this time on this matter is, That the Obſervations I made, when in *Poland* and *Pruſſia*, where I have ſeen great quantities fiſhed out of the Sea every day, and dug out the Earth, incline me to the former; nor can I conceive how thoſe Animals, that are found intomb'd in Amber, and are moſt of them, if not all, Inhabitants of the ſurface of the Earth, ſhou'd be caught in it, if it were only a Liquid when in the Bowels of the Earth.

9. A numerous Collection of very large Branches of Coral, White and Red, and one Black.

10. A large pair of Stags Horns growing out of a piece of Wood, after a very ſtrange manner.

11. Another Branch of a Stags Horn, with a large piece of Wood naturally adhering to the top of it; the top of the Horn piercing the very body of the Wood, and growing ſome Inches beyond it.

12. A Sheep, with a Horn growing out of its ſide about a foot long.

13. I meaſured the Thigh-bone of a Humane Body I ſuppoſe, that was three foot and three inches long; the Head was two foot and five inches round, and the middle of it was nineteen inches and a half about.

14. Two very large Scollop Shells, that weigh two hundred twenty four pounds each.

15. A piece of Marble, with a Natural repreſentation of a Crucifix on its outſide, mightily valued by the *Lutherans*. And I remember Dr *Hartman*, who wrote *de Succino Pruſſiaco*, in the year eighty five, ſhew'd me at *Koningsberg* in *Pruſſia*, a piece of Whitiſh Amber, having a Woman with a Child in her Arms, prettily repreſented by variety of Colours on the Superfice; I ſuſpected it to be Artificial,

al, but he aſſured me the contrary, and kept it very Religiouſly.

There were beſides theſe a great many more Natural Rarities, which my ſhort ſtay there would not permit me to examine.

Among the Artificial Curioſities,

I obſerv'd,

1. A Skeleton made of Ivory in imitation of a Humane Skeleton, two foot and ſix inches long, ſo Artificially and Curiouſly put together, that any one well skill'd in Oſteology may take it for a Natural one.

2. Two Crucifixes of Ivory, with the whole Hiſtory of our Saviour's Paſſion, extremely well carved and expreſt, and are both a very pretty Curioſity. I ſaw there a great variety of Nicknacks made of Ivory, curiouſly wrought on the outſide: A ſmall Man of War of Ivory, with Silver Guns in it; ſeveral ſmall Sloops and Galleys of the ſame, and one of the Unicorns-Horn, with a Gold Anchor.

3. A Watch made of Ivory, with all its Wheels and Motions. Several other Utenſils made of Ivory and Unicorns Horn, prettily Carved and Turn'd: Beſides ſome others of Ebony, Heart Oak, Box, Amber, Silver, Braſs, *&c.* which are kept together for the Curioſity of the Workmanſhip.

4. In another Chamber there is nothing but the Garments, Arms, and Utenſils of *Indians*, *Turks*, *Greenlanders*, and other Barbarous Nations, which for their number and Variety entertain the Eye with a very agreeable Pleaſure.

5. A Perſpective of the late King of *Denmark*'s Family, the Queens Face being in the middle, and eight Princes and Princeſſes round her, yet all Club to make the Face of the King, thro a hole of a Glaſs Tube.

6. Six Golden Sepulchral Urns, found in the Iſland of *Fuenen*, *anno* 1685. by a Boor there, as he was plowing his Land; they were full of Aſhes or a greyiſh Earth when found. The biggeſt is two ounces and a half, the other five about two ounces and a drachm. This confirms the accounts given us by *Saxo Grammaticus*, *Olaus Wormius* and others, that it was a very ancient Cuſtom among the Northern Nations to burn their Dead, and then bury their Collected Aſhes in Golden Urns. They were very thin, and had three Rings of Gold round their Necks, and ſeveral Circles one within another, with one Common Center carv'd on the outſide round the body of the Urn. They held between four and five ounces of Liquids.

7. Another Sepulchral Urn of Cryſtal, of a Conical figure, found near *Bergen* in *Norway* about thirty years ſince, with a Gold Wire about it, that weighs eight ounces.

8. I ſaw in another Chamber ſeveral *Urnæ Lachrymales*, in which were collected the Tears of Friends, which afterwards the old *Romans* mix'd with the Aſhes of the Dead: Theſe were ſome of Glaſs, and ſome of Earth, and of ſeveral ſizes. Braſs Lamps of ſeveral Magnitudes and Shapes; ſome of other Metals, others of Earth, in the Shape of Animals or Idols, that were worſhipp'd by the Antients. The *Stilus Æneus* of the *Romans*, the one end ſharp, the other blunt, the firſt to write with, the other to rub out what was written.

9. The large *Daniſh* Horn of pure Gold, weighs an hundred two ounces and an half, is two foot and nine inches long, and holds about two quarts of our meaſure: This Horn was found *anno* 1639. accidentally by a Country Girl in the Dioceſe of *Rippon* in *Jutland*: 'Tis, no doubt, ſome *Runick* piece of great Antiquity by the Figures carv'd on the outſide, which ſeem to be Hieroglyphicks, Monſtrous Shapes of Devils, Hobgoblins, *&c.* perhaps ſome of theſe might repreſent their Gods, and probably this Horn was uſed in their Sacrifices, as of old among the *Aſſyrians* and

other ancient Nations, who were wont on Solemn occaſions to Entertain the Croud with mighty noiſes of Horns and Trumpets, or rather to drink out of at their Solemn Treats.

10. The *Oldenburg* Horn of pure Silver, gilt with Gold, and variouſly Enamell'd with Green and Purple Colours, and weighs about four pounds. The *Daniſh* Antiquaries tell us ſtrange Fabulous Stories of this Horn, which I ſhall omit at preſent; only obſerving, that whereas they ſay this Horn was given to Earl *Otho* of *Oldenburg*, *anno* 989, by the Workmanſhip of it 'tis plain it cannot be of that date; for the Figures and Characters Engrav'd and Emboſs'd on its outſide are Modern; which, with the Enamelling and other Ornaments, all curiouſly done, pleaſe the ſight mightily, and make a very fine, as well as valuable Curioſity. I found in the ſame Chamber a great many Horns of this kind, ſome in Metal, ſome of Bullocks Horns tipp'd with Gold about the Edges, others of Ivory, Unicorns Horns, *&c.* all prettily wrought on the outſide with a great variety of Emblematical Fancies, according to the humours of thoſe Countries and Times they were made in; which were ſo many Cups to drink out of at their Solemn Entertainments; and this of *Oldenburg* was finer than the reſt, becauſe deſign'd for the Royal Table. 'Tis ſaid to be made by Command of *Chriſtian* the Firſt, who lived in the fifteenth Century, and did it in honour of the three Kings of *Cullein.*

I went one day aſhore on the Iſland of *Weenen*, which our Sailors call *Scarlet Iſland*, from a Tradition, that Q. *Eliz.* offer'd as much Scarlet Cloath for it as wou'd cover it. This Iſland is now an appendix to *Schonen* in *Sweden*, not above half a league from the Main Land. Here I obſerv'd the Ruins of *Tycho Brahe*'s Caſtle, which he built on this Iſland, given him by King *Ferdinand*, who ſupplyed him with Money for the carrying it on in the year 1567. This Caſtle was built in the middle of the Iſland, but is now demoliſh'd, moliſh'd, and quite raz'd to the Ground, and all the Vaults and Under-ground Works fill'd up except the large Obſervatory, which *Gaſſendus* tells us, in the Life of this Noble *Dane*, was diſtinguiſh'd from all the reſt of his Apartments under-ground, that were very many, by a ſolid round Stone Wall, part of which remains ſtill. This was his great Obſervatory, and was call'd by him *Stellæburgum*, or the City of Stars; as the Caſtle was *Uraniburgum*, or the City of the Heavens. The Situation was pleaſant no doubt, it being on a very little riſing ground, in the middle of a plain Iſland, not above three miles round. The ſame Author tells us, the King of *Denmark*'s Liberality was ſo great towards this Learned man, that the beſt Workmen were employ'd about it, and every thing well contriv'd both for pleaſure and conveniences of room, for Inſtruments and Aſtronomical Obſervations above and under ground, beſides noble Gardens, Fiſh-ponds and a Park: But the Fate of War between *Sweden* and *Denmark*, ſometimes one being Maſter, and ſometimes the other, of this Iſland, no one Stone is left of this Magnificent Superſtructure. His Inſtruments, that were very fine, are now ſcatter'd up and down in *Germany*, and ſome few remain in *Copenhagen*; his own Cœleſtial Globe I ſaw there in the *Rown* Tower, which was ſix foot and three quarters in Diameter.

This Tower was built 1601, for the making Aſtronomical Obſervations, near the Royal College in *Copenhagen*, and is above a hundred and fifty foot high, whoſe *Area* on the top is ſixty foot diameter: The paſſage up to it is large enough for two Coaches, and the Aſcent ſo eaſie and hardly perceivable, that it ſerv'd for a place of Parade for their Gentry, when they had a mind to take the Air in their Coaches, riding up to the top, and ſo round the Ring, as well as for an Obſervatory.

But Monſieur *Romer*, the great Mathematician and Aſtronomer of the preſent Age, has converted the upper part of this Tower now to other uſes, where in a dark Room he has his Inſtruments for obſervation. Here I ſaw his Machine for obſerving the Stars by day: There is a Pole eight or ten foot long, erected perpendicular in the Center of an Equinoctial Plain; on the top of this Pole is faſten'd a Teleſcope, not much above three foot long, which runs thro' the Roof of the Chamber, whoſe Elevation is directed by an Aſtronomical Dial upon the Equinoctial Plain, with an Index fitted to it for that purpoſe, which determines it to the Star he has a mind to obſerve at any time.

He is ſaid to be the Inventer of two other Machines of great artifice and uſe: By the one he will ſhew at any time the Station of any Planet, according to the *Copernican* Hypotheſis; by the other he will demonſtrate all the Eclipſes of Sun or Moon paſt or to come.

There is beſides all theſe, in the Kings Houſe in the Garden at *Copenhagen*, a Royal Throne all of Unicorns Horn, on which all the Kings of *Denmark* are ſeated at their Coronation; but this, when I was there, with the reſt of the Regalia, was ſecured and carried away, becauſe they wou'd have been too much expoſed had the King of *Sweden* Bombarded this Town, as it was fear'd, when he landed on the Iſland, being but a little within the Wall towards the Land ſide.

In the year 1685. I was at *Koningsberg* in *Pruſſia*, where I ſaw the Knife which was ſwallow'd by a *Pruſſian* Boor; who being Crop-ſick one morning, thruſt the Haft of his Knife down his Throat, in order to make himſelf diſcharge what offended his Stomach; but forcing the Knife too far, it ſlipt down his Gullet into his Stomach: from whence it was taken out by an Inciſion on the Left ſide, a little below the Short Ribs, with that ſucceſs, that he lived ſeveral years after it in very good health. This happen'd in the year 1635. The Operation was perform'd by Dr *Daniel Swab*, a Phyſician and Surgeon, and the Knife is kept in a Velvet Bag in the King of *Pruſſia*'s Library, where I ſaw it. I meaſured it by an *Engliſh* Foot Rule I had then in my

Pocket, and found it to be of our meaſure but ſix Inches and about a half long, as 'tis expreſs'd in the Cuts given us of it. What their Authors mean, by ſaying the Knife was *decem tranſverſos digitos longum*, I don't know; but this has made the Story ridiculous to a great many people, who will hardly be perſwaded, that any body can paſs through the *fornix palati*, or Vault of his Mouth, a Knife of that length in a right line.

I made enquiry concerning it, and was very well aſſured by ſeveral people of the Town the matter of fact was true; and 'tis hard to think, the King of *Poland*, who was then at *Koningsberg*, the Government of the City, and the College of Phyſicians, who were conſulted upon the Operation; and, together with his *Poliſh* Majeſty, were Eye-witneſſes of it, ſhou'd by the Certificates they have publiſh'd of it in Print, Contrive to impoſe a Cheat upon the World. And I remember, talking one day with one Mr *Taylor*, a *Scotch* Merchant in *Koningsberg*, he told me, that *Andrew Grunheide*, for that was the mans name, was his particular Friend and Acquaintance; that he ſaw his Wound ſeveral times when his Surgeons dreſs'd him, and was Godfather to one or two of his Children after his Recovery.

When I was laſt in *Amſterdam*, I had the Curioſity to go to a Tavern, where the Maſter was very Curious in Birds, and had a great variety of ſome very uncommon ones; amongſt which, in a Chamber by itſelf, he ſhow'd me a Cage with a Bird in it a little bigger than a Capon, which he valued as a great Rarity, and told me it coſt him near a hundred pounds Sterling: He takes a Groat from every body that is admitted to ſee it. I muſt needs ſay I never ſaw a more beautiful Creature in all my life; in Body ſomewhat like a Hawk, but its Head and Neck bald like a Vulture, only a few ſhort Feathers over his Eyes like Eye-brows, his Eyes were pretty large, and the *Iris* of a very fine bright Pearl Colour, which gave a great beauty to this Bird. The

Colour of his Feathers is ſo curiouſly mixt with that variety that no Painter can imitate them, and entertains the Eye with a great deal of pleaſure: His Bill and Head in ſhape are more like the Eagle than the Vulture, tho I take it to be of the kind of the latter, but of the leſſer ſort.

This Bird came from *Carthagena* in *America*, and may be deſcrib'd thus: *Vultur Americanus minor Carthagenæ Corpore Eleganti & plumis admodum Concinne variegatis.* I preſume this Bird can hardly be of the ſame kind with thoſe Vulturs *Monardes* tells us of in the Iſlands near *Lima* in *Peru*, that prey'd on their living Cattel in the Fields, if not carefully watch'd by their Keepers.

did not ſee the Cherry-ſtone in the King of *Denmark*'s Cabinet, which I was told had ſome hundreds of Heads engraved on the outſide of it; but I remember an *Engliſh* Gentleman ſhew'd me once in *Holland*, in the year 87, a Cherry-ſtone of this kind with a hundred and twenty four Heads on the outſide of it, ſo that you might diſtinguiſh with the naked Eye, Popes, Emperors, Kings and Cardinals, by their Crowns and Mitres. 'Twas bought in *Pruſſia*, where it was made for three hundred pounds *Engliſh*, and is now in *London*, there having been a Law-ſuit not long ſince commenc'd about it in *Chancery*. Whither this or any Artificial Curioſities before-mention'd of Ivory, *&c.* may compare with *Homer* in a Nutſhell? or the Ivory Ants and other ſmall Creatures ſaid to be made by *Callicrates*, whoſe parts were ſo very ſmall, that no body cou'd ſee them, ſo as to diſtinguiſh one from another, but he that made them? or the Ivory Chariot made by *Mermecides*, which a Fly cover'd with his Wing, and a Ship of the ſame hid under the Wing of a Bee? And if thoſe things be true, as *Pliny* and *Solinus* tells us, whether the Ancients have not outdone us in ſuch kind of Impertinencies, I ſubmit to your Judgment.

Gazophylaci *Naturæ* & *Artis*;
Decaſ. 1.

In qua *Animalia, Quadrupeda, Aves, Piſces, Reptilia, Inſecta, Vegetabilia*; item *Foſſilia Corpora, marina,* & *ſtirpes Minerales* e Terra *eruta,* Lapides *figura inſignes,* &c. *Deſcriptionibus* brevibus & *Iconibus* illuſtrantur. *Hiſce annexa erit* ſupellex Antiquaria, *Numiſmata,* Gemmæ *Exciſæ* & *Sculpturæ,* Opera *Figulina, Lucernæ, Urnæ, Inſtrumenta* varia, *Inſcriptiones, Buſta,* reliquaque *ad rem priſcam* ſpectantia; Item *Machinæ,* Effigies *Clarorum Virorum,* omniaque *Arte* producta. *A Jacobo Petiver* Pharmacop. *Lond.* & Regiæ Societatis *Socio.*

Londini ex Officin. *S. Smith* in Cœmetero *D. Pauli,* & *Chriſt. Bateman* in vico vulgo dicto *Pater-Noſter-Row.* 1702.

THe moſt Induſtrious *Author* of theſe *Decades* in *Natural Hiſtory* hath for many years laſt paſt procured at his own private Expence many and great Collections of *Plants, Quadrupeds, Birds, Fiſhes, Inſects, Shells, Figur'd Stones,* and other *Foſſils*; and continues ſtill to receive freſh and rich Cargoes of ſuch natural products (many of which in perfection) from his very numerous Correſpondents in the *Eaſt* and *Weſt Indies,* in *Africa,* and moſt parts of *Europe.* Some Specimens whereof he hath already given in his *ten Centuries,* and deſigns a publication of others with elegant and lively *Icons* (beſides Explications) by way of *Decades,* which will convey a moſt clear and laſting Idea of the things themſelves, and leave to poſterity many noble materials towards raiſing the immenſe ſtructure of *Nature*, which is not to be carried on without the joint ſtock of all Ages, and the generous contributions of ſuch as think fit to promote the liberal Arts and Sciences, whoſe *Benevolence* in this kind our Author is ſo grateful as to commemorate by particular Inſcriptions of their *Names*, fixt on his perennial Tables, far more durable and extenſive than Pyramids, or Pillars, or any other artificial Monuments.

'Tis not therefore to be doubted but this deſign of our *Ingenious* and *Laborious Undertaker* will meet with general encouragement, by reaſon of the Beauty and Majeſty of the Subject, no leſs than God's Creation, wonderful and uſeful in all its parts, to the Life of Man, and none of the leaſt amongſt the many irreſiſtible antidotes againſt Atheiſm.

One Advantage will accrue, by publiſhing theſe things in *Decades*, that of preſerving them entire; which are too often mangled, abſconded, or ſcatter'd by change of hands, if not utterly loſt for want of ſome little encouragements from the publick to multiply Copies of them in the manner propos'd by the Author, who without the leaſt affectation or vanity deſerves all juſt and reaſonable contributions for defraying his firſt Coſts, if not for rewarding his pains in Commenting, Illuſtrating, Drawing and Engraving; a Proof whereof is here given in a few particulars of the firſt *Decade*.

The ſecond Decade is juſt finiſht, and the third ready for the Preſs.

GAZOPHYLACUM NATURÆ & ARTIS. Tab. I.

Fig. 1. TO begin with Fig. 1. This little beautiful *American Lizard* is very peculiar in the ſingularity of its blue Shining Tail, and is found about the Trees in *Maryland*. Tab. I.

5. The *Cochineal* was never yet given in its 3 different ſtates or ſeveral changes, which by no body but the Author has till now been obſerved.

9. This is a very ſpecious Plant from the *Cape of Good Hope*, and is rankt amongſt thoſe Flowers which the *Spaniſh Nuns* call *Perpetuana*, becauſe they never wither.

12. A very elegant *aquatick Plant* from *Virginia*, bearing a beautiful Spike of blue Flowers.

The Author dedicates this Table to his *Grace the Arch-Biſhop of Canterbury*.

Tab. 2. In this Place the Author has ſhewn his various Correſpondents, by producing ſomething from each corner of the World, *viz.* In *Europe* an elegant *Capricorn Beetle* from *Norway*, with a greeniſh *Butterfly* in *England*, not commonly met with. He diſcovers from *Aſia* an odd Shrub from the borders of *Perſia*, and a ſort of *Schœnanth* from the Coaſts of *Cormandel*. From the *Cape of Good Hope* he gives you the Figures of two new woolly headed *Heaths*, with a ſingular graſs from the *Coaſt* of *Guinea*, and a ſort of *Ichneumen* or baſtard Waſp from *Cape Mount Serrado*, theſe 4 from *Africa*; and from *America* we have a *yellow Pimpernel* with ſtellated leaves, there being nothing like it from the three Tab. II.

other parts of the World as yet diſcovered; to this he adds a very beautiful *Beetle* and an oculated *Butterfly*.

This Table is preſented to the *Biſhop* of *London*.

Tab. III. Tab. 3. Fig. 1. Here is figur'd a very uncommon *Libella* or *Adderbolt*, far different from all our *Engliſh Kinds*, with clouded Wings like thoſe of a *Locuſt*: This was caught about *Aleppo*. The two next are beautiful ſpotted *Moths*, the firſt from *America*, the other from *India*, caught alſo about *Montpelier*, by that curious Collector of all Rarities, Mr *Charlton*; whereby we obſerve ſome things common to *Aſia* and *Europe*, as well as *America*, which Dr *Sloan* in his Catalogue of *Jamaica Plants* has given us no ſmall inſtance of: In this Plate are alſo diſcovered ſome other new *Inſects*, *Shells* and *Plants*, with the *Figure* of a beautiful *Humming Bird*, whoſe Throat is of ſo flaming a luſtre, as is ſcarce to be lookt on, eſpecially if the Sun ſhines on it.

The *Dutcheſs Dowager* of *Beaufort* was a generous Benefactreſs to this *Table*.

Tab. IV. *Figure* 1. In the 4th Table he preſents you with a genuine *Cicada* from the *Cape of Good Hope*, very different from any in *Europe*, the *Philippine Adianthum* at Fig. 4. is perhaps one of the oddeſt in Nature; this he copies from a deſign the Learned *Father Camel*, a perſon extreamly curious in all parts of natural Hiſtory, ſent Mr *Ray* and him: He hath alſo received many other things very uncommon, which you will ſee in this and the following Decades.

His two varieties of the *Blatta Bizintina* and his *Synonyms* of them are not a little curious: As alſo a *Figure* of a *Stella marina* from *China*, whoſe form is wonderful; he concludes with a green ſort of a *Sponge*, which Dr *Niſſole*, a curious *Phyſician* and *Botaniſt*, ſent him from *Mompelier*.

The Right Honourable *Charles* Earl of *Dorſet* and *Middleſex* has the *Dedication* of this Plate.

Tab. V. In this 5th Table are ſeveral curious and beautiful Plants from the *Cape of Good Hope*, with three others, one from *Aſia*, another from *America*, and the laſt both from *Africa* and the *Eaſt Indies*; he likewiſe ſuppoſes it to be *European*: his *Synonyms* are many, and Conjectures probable: Beſides theſe, ſome *Shells*, and a beautiful *American Echinus* or Sea Egg. He in this *Table* gives you a wonderful *Aurelia* or *Inſect Caſe*, which by ſome is ſaid to be the product of the *Bengall Silk*; it has this peculiar and ſtrange, *viz.* at the extremity of a long pedicle or foot-ſtalk is adjoyned a Ring, thro which wonderful Nature faſtens it to the twigs of Trees; but for a better Idea of it, I infer you to its Figure.

His Encourager of this Plate is Sir *John Hoskyns*, one of the Maſters in *Chancery* and *V. P. R. S.*

Here we preſent you, *viz.* Tab. 6. Firſt a non deſcript *Bird* from *Maryland* with a golden or yellow Throat, and from the ſame place an odd Plant with a globular white head, which he calls *Randalia*, from the firſt Diſcoverer of this Tribe. From *China* and its adjacent Coaſts are two or three peculiars diſcovered, *viz.* A Fir-leaved Cypreſs from *Chuſan*, an Iſland near *Liampo*: A White Cowry from *Emuy* with a Saffron circle, and a very ſingular criſtated Barnacle from both theſe places, which he conjectures the accurate *Rondeletius* may have ſeen by a Figure only he gives which much reſembles it; the reſt of the Plate is taken up with Plants from the *Cape of Good Hope*, and ſome *Exotick Animals* from *Africa* and *America*; from which laſt place he gives you a ſmall Fly with wonderful large feather'd Horns. Tab. VI.

The Honourable *Capt. Charles Hatton* has the Preſentation of this Table.

Two elegant *Cape Plants* are the beginning of this 7th Table, with a *Pellitory of the Wall* from the *Canaries*, altogether different from what we have yet ſeen: To theſe ſucceed two *Foreign Butterflies*, and three *Engliſh Moths*, which laſt were diſcovered by a very curious Gentlewoman in the *Weſt* of *England*, all which are wholly new. *Fig* 9. preſents you with a *Humming Bird* of the largeſt ſize, with an elegant yellow ſpeckled head, and this is the greater rarity, becauſe it's not only the firſt Bird we have yet ſeen Tab. VII.

the Figure of from the *Cape of Good Hope*, but we knew none of this kind before common to any other part than *America*. At Figure 6 is a very odd *Aurelia* or *Caſeworm*, covered with bits of twigs like ſome of our *Caddus's*, this was ſent him from *Carolina*. He concludes this Plate with a *Vegetable*, we are obliged to him for the clearer knowledge of, *viz.* the *Canary Orchili*, a ſort of *Moſs* growing on the *Rocky Mountains* in thoſe Iſlands. This the *Spaniards* uſe to give a fine Dye to their *Spaniſh* Leather.

Dr *Martyn Liſter*, one of her *Majeſty's Phyſicians* and *F. R. S.* obliged him with this Table.

Tab. VIII. The greateſt part of this 8th *Plate* is taken up with a vaſt large and wonderful *Phalæna* or *Moth*, one of the biggeſt any *Muſæum* could ever yet boaſt of, being full nine inches between the tips of each Wing, and proportionably broad; this was ſent him firſt from *Dantzick*, but came from the *Eaſt Indies*; the reſt are ſome *Plants* from the *Cape of Good Hope*, with *Inſects* and *Shells* from divers parts of the World, particularly a Curious *Rhinoceros Beetle* from *Portugal*, and a very elegant *Capricorn*, ſent to him from *Moſcow* by one of the *Czar's Phyſicians*.

That Curious Obſerver *Dr Tancred Robinſon*, Fellow of the *Colledge of Phyſicians* and *Royal Society* has the dedication of this Plate preſented to him.

Tab. IX. The ninth *Table* begins with the ſeveral changes of a little *Turtle Beetle* from the *Philippine Iſles* obſerved there, and very accurately delineated by the Reverend *Father George Joſeph Camel*, a perſon very curious in all parts of Natural Hiſtory, and has promiſed this Author the communication of them, which will be no ſmall diſcovery from ſo remote a part of the World. Here follows ſome *Shells*, one of which is a *Balanus* very ſingular brought him from the *Iſle of Aſcention*, which with other things the *Iſland* affords, he has given an account of in the *Philoſoph. Tranſactions*, No 255. Here are 3 *Papilios*, two from *Angola*, and one from the *Cape*, all very beautiful with two *Tipulæ* or *Water-ſpiders*, both which the Author hath obſerved in ſome Ponds about *London*. But above all we muſt not omit a very odd Animal, *viz.* A *Flying Quadrupede* which Father *Camel* ſent him a deſign of, by the name of *Cato-Simius* volans or *Flying Cat-Monkey*; the Author has deſcribed it in the *Philoſoph. Tranſ.* No 277. whither I refer you, and here for its Figure, which is indeed very ſtrange. Here are alſo two *Algas* or *Sea Weeds*, the laſt a very elegant one from the *Cape of Good Hope*, ſent him from that curious Correſpondent of his, Mr *John Starremberg*.

The Author Dedicates this Table to Dr *Hans Sloan*, Fellow *of the Colledge of Phyſicians*, Secretary *of the Royal Society*, &c.

The *laſt Table* of this *Decade* is compos'd of ſundry curious *Animals* and *Vegitables*, amongſt the firſt, is a very beautiful *Tricolor Snake*, from the *Cape of Good Hope*, compos'd of red, yellow and black; and a Bird from the ſame place, the greateſt part ſcarlet, much reſembling our *Virginia red Bird* or *Nightingale*, but is peculiarly different in having a cleft Bill; here are alſo ſome *Shells* Figured, and an *American Scarab* or *Beetle*, with two black orbicular velvetty ſpots, reſembling Eyes very particular; to theſe are added two rare *Butterflies*, the 1ſt Fig. 6. a yellowiſh one with ſpots of black and blew, the only one the Author had ever ſeen, the other a very elegant caudated *Papilio*, beſprinkl'd underneath with curious bliſtery ſpots, ſhining like Silver over laid with a Golden luſtre, both theſe out of Mr *Charlton*'s noble *Muſeum*, which is now in the hands of Dr *Sloan*, who himſelf had before a vaſt Collection of all natural things, and not only from *Jamaica* where he perſonally was, but has and does daily add to them at his no ſmall Expence, whatever can be procured both from abroad and at home. Our Author concludes with a *Coralline* incruſtrated *Moſs* from *Scotland*, and a very curious blew ſpeckl'd *Corall* obſerv'd in the *Philippine Iſles*, by that moſt induſtrious Naturaliſt *George Joſeph Camel*, from whom he hath lately received Tab. X.

ceived ſeveral other very curious rarities, which he promiſes to preſent you withal in his ſucceeding *Decades*.

He Dedicates this *Table* to his Benefactor Mr *John Owen*.

The Author his *Second Decade* is juſt finiſhed, and his third is in great forwardneſs, above half being already done.

LONDON, Printed for *Sam. Smith*, and *Benj. Walford*, Printers to the
Royal Society, at the *Prince's Arm's* in St *Paul*'s Church-yard.

Philoſophical Tranſaction, No 284.

ERRATA.

PAge 1358. l. 3. for *and* r. *or.* p. 1361. l. 2. alſo. p. 1363. l. *ult.* for *had* r. *have.* p. 1365. l. 15 for *highly* r. *lightly.* p. 1368, l. *ult.* for. *e* r. *c.* p. 1369. l. 28. del. *number:* p. 1371. l. 6. for *a* r. *the.* *ibid.* l. 20. r. *Mechaniſm:*

ADVERTISEMENT.

THat Curious Perſon *Madam Maria Sybilla Merian*, who hath already publiſhed two Vollums in *Quarto*, concerning ſuch *Inſects* and their ſeveral changes, which ſhe had obſerved in *Germany* and *Holland* with their *lively Figures*; being lately returned from *Surinam* in the *Weſt Indies*, doth now propoſe to publiſh a *Curious Hiſtory* of all thoſe *Inſects*, and their tranſmutations that ſhe hath there obſerved, which are many and very rare, with their *Deſcription* and *Figures* in large *Folio* on *Imperial Paper*, containing 60 *Tables*, curiouſly performed from her own Deſigns and Paintings. Theſe ſhe propoſes at thirty ſhillings a *Vollume*, *viz.* ten ſhillings in hand, and ten more at the receipt of one Moity or 30 Tables, and the reſt to be delivered on the third payment.

Such Perſons as are willing to Subſcribe for a work of this Nature, (which for its Curioſity and Performance very well deſerves publick Encouragement) She deſires the firſt Payment may be ſpeedily made to *James Petiver* Apothecary in *Alderſgate ſtreet*, *London*, to whom ſhe hath ſent ſeveral Tables, and ſome in Colours, to ſhew their Curioſity, and how admirably they are engraved, which may be ſeen by any that deſire it. The Work is in great forwardneſs, and highly approved of by all that ſee it.

ADVERTISEMENT.

THere having been lately Propoſed by Subſcription Mr *RAY*'s third and laſt Vol. of his *HISTORY* of *PLANTS*, whereby that whole Work is compleated containing more Plants, and Deſcription of new *Species*, than all the Books yet extant on that ſubject; many hundreds being communicated from the Streights of *Magellan*, the *Philippine Iſlands*, and ſeveral Countries never ſearched of Plants before. By *F. Georgio Camelli* and other *Virtuoſi*, who either reſide, or have made careful remarks in the reſpective places; all diſpoſed in an eaſy method, to be found by their Tribes and Characteriſticks; with an account of ſuch parts of them as are either Specificks for ſome Diſeaſes, as the *Peruvian Bark* &c. or are Univerſal Medicines, as *Faba St Ignatij*, &c. beſide many peculiarities belonging to particular Plants, every where occuring in the Work. The ſame is already well advanced at the Preſs, as may be ſeen by the Sheets Printed off at the Undertakers *SAM. SMITH* and *BENJ. WALFOD*, Printers to the Royal Society, at the *Prince's Arms* in St *Paul*'s Church-yard: Of whom Propoſals may be had, and Printed Receipts given for the firſt payment.

BRITISH MUSEUM
NATURAL HISTORY.

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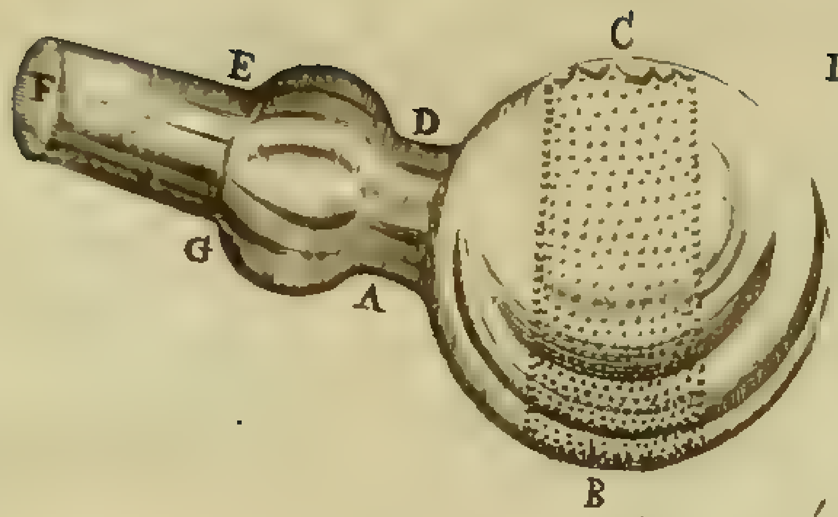

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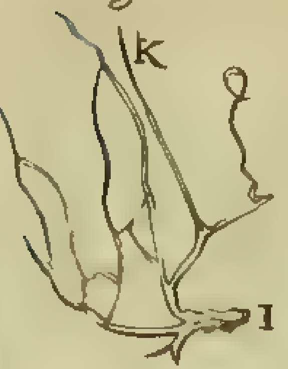

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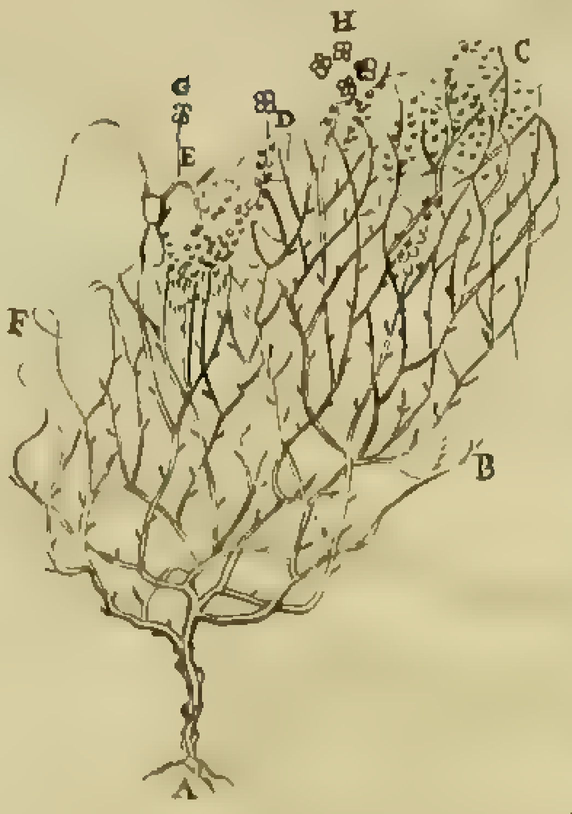

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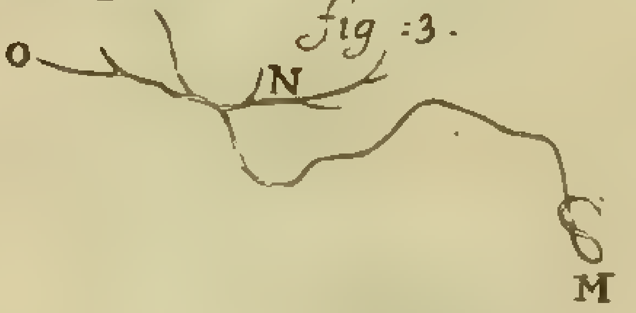

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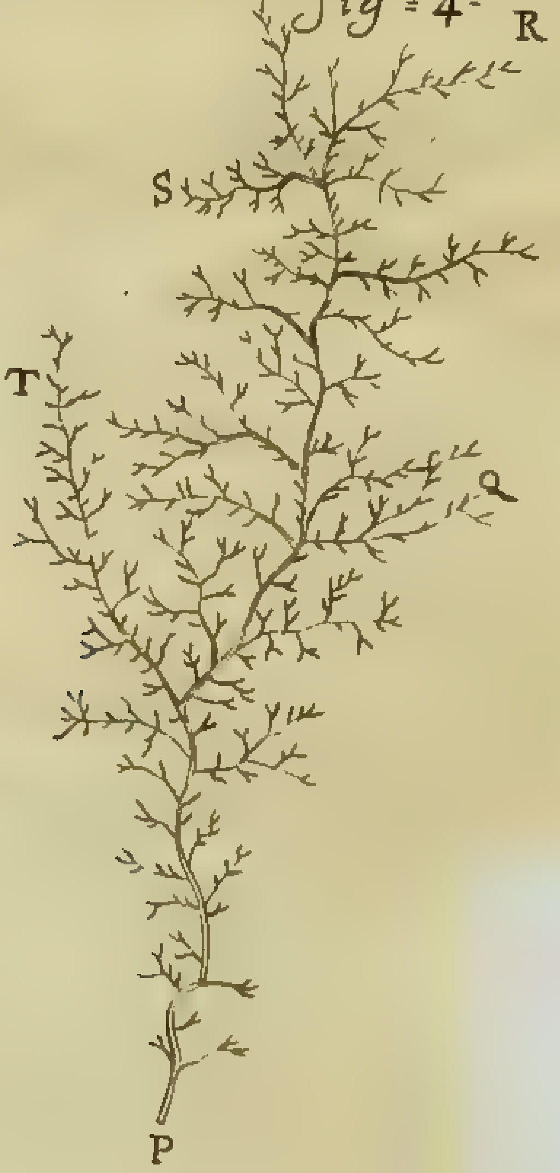

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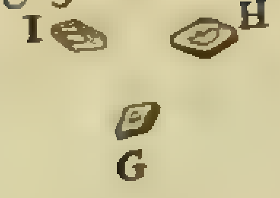

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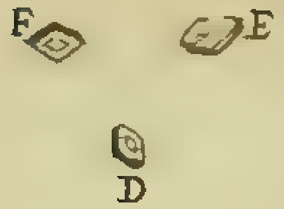

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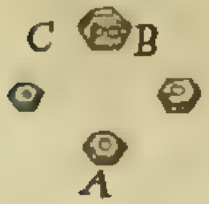

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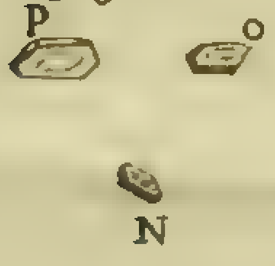

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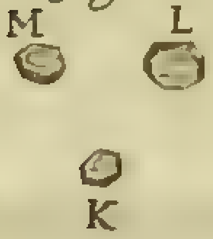

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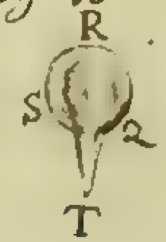

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PHILOSOPHICAL TRANSACTIONS.

For the Months of July *and* Auguſt, 1703.

The CONTENTS.

I. *An Extract of a Letter to Dr* Edward Tyſon *from the Reverend Mr* Charles Ellis, *giving an Account of a young Lady born Deaf and Dumb, taught to ſpeak. That* Coſterus *firſt invented Printing,* Anno 1430. *Of the Phyſick Garden at* Amſterdam, *and the Chamber of Rarities at* Boln. *Of a Monſtrous Birth. Of the Quarry at* Maeſtricht. Fr. Linus's *Dyals at* Leige. *The* Cachot *or Rooms cut in the Rock of the Caſtle of* Namur. *Sir* Jo. Mandevil's *Tomb at* Leige. *The* Frieſland *Boy with Letters in his Eye,* &c.

II. *A* Deſcription *of ſome* Corals, *and other curious* Submarines *lately ſent to* James Petiver, *Apothecary and* Fellow *of the* Royal Society, *from the* Philippine Iſles, *by the Reverend* George Joſeph Camel; *as alſo an Account of ſome* Plants *from* Chuſan, *an Iſland on the Coaſt of* China; *Collected by Mr* James Cuninghame, *Chyrurgeon &* F. R. S.

III. *Part of a Letter from Mr* Anthony van Lewenhoek, *F. R. S. concerning his Obſervations on ſome* Animalcula *in Water, the diſſolution of Silver,* &c.

IV. *A Letter from the Reverend Mr* William Derham, F. R. S. *to Mr* John Haughton, F. R. S. *containing his Obſervations on the Weather,* &c. *for ſome years laſt paſt.*

I. *An Extract of a Letter to Dr* Edward Tyſon *from the Reverend Mr* Charles Ellis, *giving an Account of a young Lady, born Deaf and Dumb, taught to ſpeak. That* Coſterus *firſt invented Printing,* Anno 1430. *Of the Phyſick Garden at* Amſterdam, *and the Chamber of Rarities at* Boln. *Of a Monſtrous Birth. Of the Quarry at* Maeſtricht. Fr. Linus's *Dyals at* Leige. *The* Cachot *or Rooms cut in the Rock of the Caſtle in* Namur. *Sir* Jo. Mandevil's *Tomb at* Leige. *The* Frieſland *Boy with Letters in his Eye.*

Bruxelles $\frac{14}{24}$ July, 1699.

Moſt Honoured Doctor,

AT *Haerlem* I viſited *Van Dalen*, the Author *de Oraculis*; he is ſetting forth another piece *de Sacerdotio Veterum*, a moſt Learned, Laborious, and very Inſtructive Work. He ſhewed me beſides his own, a Curioſity of a young Lady born Deaf and Dumb, yet taught by Dr *Amman* to ſpeak very intelligibly, I heard her read *Dutch* and *Latin*; ſhe is about 17 years old, the only Child of a Wealthy Merchant.

Here I was deſirous to ſee the firſt Book Printed by *Coſterus*, which *Van Dalen* himſelf had never ſeen, and with much trouble obtain'd to do it; I find it not to be *Donatus*, as the *Inſcriptiones Hollandicæ* ſay, nor *Virgil* or *Tully's Offices*, as others have acquainted the World; but a *Dutch* piece of *Theology*, Printed on one ſide only of the Paper; and after this is a ſingle page of *Latin* entitul'd, *Liber Vitæ Alexandri Magni*, which made ſome believe it to be *Q. Curtius*, but it is a Monkiſh *Latin* of that time. This and the *Theology* were Printed in the year 1430, whereas the *Inſcriptions* and ſome other Authors have told us from *Coſterus*'s Picture, that Printing was by him invented but *Anno* 1440. But a Picture of *Coſterus* before another *Dutch* piece (bound up in the ſame Volumn and Printed 1432) bears the date of 1430, under which Picture is the *Inſcription* mention'd by Mr *Ray*, (only the date x years ſooner) and the *Tetraſtic*, which is tranſcrib'd by the Author of the *Inſcriptions* from an *Effigies* of *Coſterus*, which was then extant in a Garden this place, but is not now to be found.

I

I was ſurpriz'd at *Amſterdam* to ſee a moſt curious *Phyſick Garden*, admirably inſtructed, and in excellent order; which becauſe it has more ſpace and foreign Plants, far exceeds *Leyden.* Here are alſo *Series Lectionum*, which I have, and ſhall ſend 'em at your Command. Our Travellers have not made much mention, as I know of, of theſe things, nor any at all of *Boln*, where is a Chamber well furniſh'd with Rarities, conſidering there is no Univerſity, Schools nor Gardens, nor any Profeſſors. There are no Catalogues Printed in *French* or *Latin*, but when I have furniſht my Memory with the help of a little *Dutch*, if you have not receiv'd any Account, I ſhall tranſcribe them by themſelves, being too long for a Letter. Beſides theſe, there occurr'd here a Rarity not then publickly expos'd, two Female Children joyn'd together from the Neck to the Navel; their Picture was with Arms embracing, and Legs twiſted, all Parts and Joynts entire to both, the *Viſcera* too all double and perfect, the Head only ſingle, but appertaining to both, and looking over the right Shoulder of one, and the left of the other. They had been open'd before I ſaw them; I could not learn by the Mother or Father, whether the *Aſpera Arteria* and *Gula* did not divide as they enter'd into the Stomach and Lungs, or whether they were continu'd ſeparate, nor any account of the Brain; they were born alive before 7 Months: The Father, *John Ameſton*, a *French* Souldier, but deſerted to this place. He preſerves them with the Skin and Muſcles, by ſponging them with ſpirit of Wine. He asks 300 Guilders for 'em, too much for a Traveller to expend upon one thing.

At *Maeſtricht* I went into the Quarry, of which you have an Account in your *Tranſactions*, but it is more wonderful than there deſcrib'd, and more large, being 3 hours in length and one in breadth, and capable to ſhelter 100000 Men. It coſt me a fit of an Ague, thro its exceſſive Chilneſs. The Stone dug from hence is much like our *Kettering*; the Jeſuits have here a very fine Chappel built of it.

Franciſcus Linus's Dyals at *Leige*, the Original of thoſe formerly in our *Privy Garden*, are ſhamefully gone to decay, none remaining of uſe, but that which diſtinguiſhes the hours by feeling, and the Globe which ſhews it in all other parts of the World. Here is but one in the Society that underſtands any thing of this matter, and he is endeavouring to make a Weather Dyal, that ſhall have a flux and reflux like the Sea, but it is yet brought to no perfection.

At *Namur* are no Curioſities, but Military, except only the *Cachot* cut in the Rock of the Caſtle, with Apartments for 600 Men, and all Rooms of uſe, as Kitchens, *&c.* this was done by the order of Mareſchal *Boufflers* to defend the Garriſon from the Bombs, and was the labour of four years.

I forgot that at *Leige* is Sir *John Mandevil*'s Tomb, whoſe Epitaph is alſo at *St Albans* with us, which may be hard to be reconcil'd.

Since my coming to *Bruxelles*, I have ſeen a young *Frieſland* Boy of about 5 years old, round the Pupil of whoſe Eye they pretend is naturally engraven *Deus Meus*, and the ſame in *Hebrew*. This is lookt upon as a prodigious Miracle in theſe parts; but upon nice ſurveying it, I could perceive it was only the *Iris* of the Eye, not circularly joyn'd, but laſh'd out into *Fimbriæ*, which here and there might be thought to form ſome imaginary Letters; as beginning at the *Lacrymal* corner of the left Eye, there is ſomething like D & I & V, but not a footſtep for the ſtrongeſt fancy to work out any more, nor any Letter of *Hebrew* in the right Eye, as they pretended. I don't doubt, but as the Boy grows up, the others may conjoyn again: But it was like to have been of danger to me to have diſcovered this matter in theſe ſuperſtitious Countreys; for acquainting a Gentleman in *Engliſh* of this Cheat, one of the Mob happen'd to underſtand it, and I was forc'd to make the beſt of my way.

In another Letter from the *Hague*, dated *June* 16. 1699. The ſame Perſon writes that at this place there are very few natural Curioſities; but a piece of Art, that of its ſort I believe never was parallell'd, which is perform'd by one *Elizabeth Pyberg*, who cuts in Paper not only Towns, as *Loo* and *Hounſlerdyke*, but Faces to an extream likeneſs; She has done King *William* and Q. *Mary* better than any Limner I ever ſaw, and refuſes 1000 Gilders for the pieces, it is ſo curious that I could not believe the Queen's Drapery not to be Point, till I had moſt exquiſitely enquir'd into it.

II. *A* Deſcription *of ſome* Coralls, *and other curious* Submarines *lately ſent to* James Petiver, *Apothecary and* Fellow *of the* Royal Society, *from the* Philippine Iſles *by the Reverend* George Joſeph Camel; *as alſo an Account of ſome* Plants *from* Chuſan *an Iſland on the Coaſt of* China; *Collected by Mr* James Cuninghame, *Chyrurgeon &* F. R. S.

The Philippine Submarines *are as follows*;

1. Hippuris *Indica* albida, geniculis nigris. 1
Hippuris ſaxea *Cluſ.* Exotic. 124. l. 6. c. 8. Fig. *Chabr.* 576. Fig. 4. I. B. V. 3. l. 39. c. 47. Fig.
Equiſeto ſimilis ſaxea C. B. 365. 19. *Ray.* H. Pl. 68. c. 6. H. Ox. V. 2. p. 657. 13.

I take this Corrall *to be an incruſtation, as it ſeems by its leſſer Branches, the greater are ſtriated between the joyuts.*

2. Rete *Philippenſe* nigrum, telis quadrangulis duplicatis, 2

This is a rare ſpecies of Sea-fan, *its texture very like* Gawſe, *but doubly matted, as it were two folds, the baſe or bottom is narrow, ſtretching it ſelf like an open* Fan, *but round without Angles, ſee its Figure in our* Gazophylacium Naturæ & Artis. *Tab.* 32. Fig. 1.

3. Rete *Philippenſe*, ſummo albido, inferne fuſco, telis inordinatis. 3

The branches of this run one into another, without any reticulate order, below they are broad, ſtiff and brown, towards the top whitiſh and more flexible, many of theſe *ſhoots not reaching to their oppoſite branches look like ſmall Thorns.*

4 4. Coralloides *Philippenſ.* nigricans, ramulis virguloſis inter ſeſe connectantibus.

This branches much and runs one into another, eſpecially the fuller grown, the larger the branches the blacker, the younger are brown.

5 5. Corallium nigrum *Borneocum* ramulis virgultis *Muſ. Petiver.* 177.

This differs from the laſt in not netting its branches, are more plyable, obſerving a buſhy order, that a flat and Fan-like.

6 6. Myriophyllon *Indiæ Orientalis* ramoſiſſimum. an *Abies* maritima Coralloides pennata ſubhirſuta *Breyn:* prodr. 2. Fig. 35.

Breynius *his* Figure *very well anſwers this ſubmarine:* Its Stalks *are black, but hairy diviſions* brown, *the leaſt of which laſt thro the Microſcope appears thick ſet with ſmall Thorns, as you may ſee them expreſt in the 4th* Decade *of my* Gazophyl. *Nat.* & *Art.* Tab. 35.

7 7. Myriophylon *Philippenſe* ſetaceum.

This is not branched in the main, in which it differs from the laſt, and in growing buſhy like a Fox-tail.

8 8. Alcyonium *Philippenſe*, ramulis gelatinis implexis.

This is a very odd ſubmarine, *compos'd of a brown ſhining ſubſtance like Glew, ſomewhat brittle if hard preſt, it's peculiarly matted not exactly reſembling any other thing I ever yet ſaw;* ſee *its* Figure *in the 32d* Table *of my* Gazoph. Nat. *&c.*

9 9. Erica pelagica *Philippenſis* carnea.

This is a beautiful incruſtrated Coral, *of a pale brick or fleſh color, its leſſer branches are finely warted and ſhoot, elegantly one into another, the whole is flat and flexible like a* Sea Fan, *its cruſt thin, hard, and taſtes like* Brick duſt, *the* Coral *underneath is of a Wainſcoat colour.*

10 10. Coralloides epiſpongioſa *Philippenſis*, virgulis albis carneis, minoribus, punctatis.

11. Coralloides epiſpongioſa *Philippenſis*, virgulis dilute 11
carneis, minoribus, punctatis.

12. Coralloides epiſpongioſa *Philippenſis*, virgulis ſaturate 12
carneis, minoribus, punctatis.

13. Coralloides epiſpongioſa *Philippenſis*, virgulis e dilute 13
minio, minoribus, punctatis.

14. Coralloides epiſpongioſa *Philippenſis*, virgulis ſatura-
te purpureis, minoribus, punctatis. *Gazoph.* Nat. & Art. 14
Tab. 31. Fig. 8.

15. Coralloides epiſpongioſa *Philippenſis*, virgulis dilute 15
purpureis, minoribus punctatis.

These laſt differ very little but in color, ſome of them are
ſpeckl'd, and few of the twigs exceed in thickneſs thoſe in a
Birchen rod : *The cruſt is hard and ſomewhat ſpongy, the body*
under it is brown and blackiſh, and near of kind to No 5. 16

16. Coralloides epiſpongioſa *Philippenſis* virgulis paucioribus punctatis, ſanguinei coloris *Gazoph Natur.* Tab. 31. Fig. 12.

This is like the foregoing, but has fewer branches.

17. Coralloides epiſpongioſa PHILIP. virgulis Cur- 17
cumæ coloris punctatis. *The* Twigs *of this are ſomewhat*
thicker than the former.

18. Coralloides epiſpongioſa PHILIP. virgulis albis 18
craſſioribus punctatis.

The Coral *of this ſeems not to differ from* No 5. *the ſpongy incruſtrations, are thicker than the reſt, and the punctures or holes deeper and more obvious the cruſt if crackt will turn round the Stalk.*

19. Coralloides epiſpongioſa PHILIP. virgulis ligno- 19
ſis fulvi coloris ſulcata & foraminibus verrucoſa.

This differs from the 9 *laſt in having its Twigs of a more porous woody ſubſtance, rather than like* Corall, *and its outward cruſt has a furrow on each ſide interperſt with protuberent punctures.*

20 Fucus PHILIP. carnoſus, edulis. *Golo* Luzon. *Ga-* 20
zoph. Nat. *Tab.* 27. Fig. 12.

The *Chuſan* Plants received from Mr *James Cunninghame* are as follows, *viz.*

21. Lin-

21 21. Lingua Cervina CHUSANENSIS maculata, media.

The Root of this is like our common Polypody *with Fibres running from them, the Leaves reſemble* Hartstongue, *but are longer and narrower, but as that bears its Seed in ſlant ſtreaks on the back of the Leaves, theſe have them in round ſpots like thoſe in* Polypody, *one on each ſide of the middle rib at near half an inch diſtance, beginning near the point, and reach above half the Leaf.*

22 22. Lingua Cervina CHUSAN. maculata, parva.

This has a fibrous Root, its Leaves have ſcarce any footſtalks and rarely exceed 3 inches in length, the Seed ſtand in round ſpots like the laſt, as large but much cloſer ſet, reaching from the middle rib to the edge of the Leaf coming down about half way.

23 23. Arundo CHUSAN. polydactyloides perelegans.

This Rheed has a very beautiful tuft, compos'd of above a dozen pappoſe ſpikes, like ſome of our Indian *downy Cocksfoot graſs, each above a ſpan long.*

24 24. Gramen *Lagopoides* CHUSAN, ſpicis ariſtatis palleſcentibus.

This is next of kind to our Gr. Lagopoides Guineenſe Gazophil. *Nat. &c.* Tab. 2. Fig 7. *&* Muſ. *nſt.* 238. *but its ſpikes are larger, and both glumæ & ariſtæ are whitiſh, whereas the* Guinea *ſort, when full ripe is ferrugenious, and its ſpike turns downwards.*

Dr Hans Sloan *has the only ſpecimen I have as yet ſeen of this new Graſs.*

25 25. Panicum criſtatum CHUSAN. ſpica multiplici nuda.

This is a very elegant Graſs, each Capſule ſomewhat reſembles thoſe of our Naſturtium verrucoſum *or* Swines Creſſes.

26 26. Secalis facie Frumentum *Chuſanicum.*

27 27. Cadelari SICILIANA folio acuto. Amaranthus Siculus ſpicatus, radice perenni Boccon Plant. rarior p.

17.

17. Fig. Almag. Botan: 26. pl. 16. Tab. 260. Fig. 2. opt Ray H. Pl: 203.

The Hortus Malab. *giving the name of* Cadelari *to this late diſcovered genus of Plants, I have choſe to diſtinguiſh it under that title rather than* Amaranthus, *from whence it is very different and has this peculiarity that when ripe the Seed hangs downwards.* Sicily, Madera, Jamaica, *and ſeveral parts of* Aſia *produce this Plant.*

28. Perſicaria CHINENSIS, folio ſubtus albido. Muſei noſtri 950. 28

This reſenbles our Arſmart, *but the leaves underneath are very white and ſoft.*

29 Triopteris ſcandens CHUSAN. cordato folio. 29

This is a twining Plant, like our black Bryony, *and its Leaves not unlike ; the* Capſules *reſemble the* Melianthus, *but hath only 3 Wings containing membranaceous Seed, like thoſe of the* Oleander *or* Roſebay.

30. After Eupatoroides CHUSAN. Hyſſopi folio. 30

The Leaves ſtand alternately on the Stalk, which towards the top branches out into many ſmall Flowers with little radiated petala, theſe look at firſt view like our Eupatorium *or* Dutch Agrimony, *eſpecially in bud and at firſt opening.*

31. Tuſſilago CHUSAN. ramoſa, fol. rotundo glabro. 31

This hath ſmooth round Leaves about the Root at the time of flowering, and narrow Leaves at the Stalk which is branched, each terminating in one Flower of the ſame bigneſs with ours.

32. Abrotanum CHUSAN. Thalictri folio. 32

Theſe Leaves are deeply jagg'd at top, generally into 3 or 5 ſegments, the Flowers are extreamly ſmall.

33. Abrotanum CHUSAN. ſegmentis foliorum tenuiſſime ſerratis. 33

The Flowers of this are as large as the common Southernwood, *the Leaves finely divided and notched like thoſe of ſome umbelliferous Plants.*

34. Abſcinthium umbelliferum CHUSAN. Achoavan folio. 34

Its Stalk is round, hoary and lightly furrowed, the Leaves ſomewhat like the next, but leſs, and more ſerrated, the heads of the Flowers are compos'd of tranſparent membranes, and ſmell ſtrong of Wormwood.

35. Matricaria CHUSAN. flore albo minore ſimplici. an Matricaria Japonica fl. minore albo ſimplici. Breyn. prodr. 2. p. 663.

The Leaves of this are like Mugwort *but leſs, the Flowers ſcarce ſo big as our* Fetherfew,

36. Matricaria CHUSAN. fl. luteo minore ſimplici.
35 Keukhoa Chinens:

The Leaves and Flowers are much like the laſt, the diſcus *is large and yellow as are the* petala *about it.*

36 37, Verbenaca CHUSAN. Majoranæ folio ſubtus molli flaveſcente.

On each ſide of every joynt come forth longiſh Leaves, ſome bigger others leſs, ſoft underneath and yellowiſh, from ſome of theſe joynts eſpecially towards the top come Spikes of Flowers, and Seed, after the manner of common Vervain.

37 38. Verbenaca CHUSAN Perſicariæ folio ſubtus palleſcente.

The Stalk is for the moſt part 5 *ſquare, the Leaves grow oppoſite by turns croſswiſe; it bears a long ſpike of Flowers, each with a long tube or neck ſet in a ſmall turgid* calyx.

40 40. Teucrium CHUSAN. fl. ſingulari pediculo ſemiunciale inſidente.

Each Flower ſtands ſingle on a half inch foot-ſtalk, with 4 *long ſtamina, and a ſtyle like the* Teucrium Bœticum.

41 41. Teucrium Crocodilianum Styracis folio minore. Gazophyl. Nat. Tab. 34. Fig. 11.

This is a peculiar Plant, with Leaves almoſt round, very ſoft and white underneath like Storax *but leſs.*

38 39. Mentha CHUSAN. ſpicata, holoſericea.

The Stalks of this Plant are very hoary and ſoft, as are its Leaves eſpecially the under ſide.

42. Alcea forte fruticoſa CHUSAN. folio ſummo lato, ſubtus molli. 42

The Leaves are ſomewhat like our Aſpen Tree *or* Populus tremula, *very broad at the top with a ſmall point in the middle, ſlightly notch'd, a little rough above, but underneath very ſoft.*

43. Rubus CHUSAN. folio Corchori. 43

The twigs aud footſtalks are Thorny, the Leaves ſingle, ſometimes lobated, broad at baſe, but grow tapering to a very narrow point.

44. Rubi facie planta CHUSAN. fol. Altheæ acutiore. 44

The Stalks thorny, the Leaves grow alternately on ſhort pedicles, and are ſome of them lobated, at the bottom of each grows a ſmall ſcaly cone like bud.

45, Alectorolophos CHUSAN. viſcoſa, Achoavan fol. 55

This and the next ſeems very elegant Plants, but I dare not meddle with their deſcriptions until I receive better ſpecimens of them.

46. *R*apunculus ſeu Cardinalis forte CHUSAN. Sambuci folio. 46

47. Anonis CHUSAN. pubeſcens, Lupini facie. 47

This ſeems herbaceous, the Leaves very large, ſomewhat hoary, but the Stalks much more, the Flowers ſpicated and large, reſembling the yellow Lupine, *but has the face and hoarineſs of the common blew.*

48. Aſtragalus CHUSAN. Sinapi ſiliqua. 48

Theſe Leaves reſemble the common Sainct foin, *the Pods about 3 inches long, with two or three ſwellings, and end blade pointed like the pods of* Muſtard.

49. Cowhage CHUSAN, floribus parvis ex alis foliorum. 49

The Stalks, young Leaves, Flowerhusks, *and* pods *have* [illegible] *a ruſty hoarineſs, in the full grown Leaves its much leſs; from the boſom of theſe comes a ſmall ſpike of little Flowers, by which and its hoarineſs it is eaſily diſtinguiſh'd from all others.*

50. Cytiſus CHUSAN. tetraflorus. 50

Its Leaves are ſmall, finely veined, and end in a hair, what is *peculiar in this, is to have 4 Flowers on a naked or Leafleſs inch footſtalk.*

51 51, Polygala CHUSAN. fol. ſubrotundo ſpica aphylla.

This is diſtinguiſht from others, in having broader obtuſe Leaves, excepting towards the top they are a little pointed, and from the middle of each leafy Stalk, comes out a naked ſpike of Flowers.

52 52, Androſace CHUSAN. cortuſæ Matthioli folio Mus. noſt 858 & Gazophyl. Nat Tab. 33. Fig. 8.

53 53. Lyſimachia CHUSAN. Gentianellæ folio, fl. albo.

This in manner of growing reſembles our yellow Looſtrife, *but the Flowers are white, petala leſs and more pointed, its capſule ends in a Thread. I ſaw a branch of this in Flower and Seed with Mr* Sam. Doody, *which Mr* George London *had gathered in ſome Garden, I think, about Town:*

54 54. Lyſimachia CHUSAN. ſpicata, Perſicariæ fol. fl. exiguo.

Theſe Leaves grow inordinately, are narrow point and baſe, without Footſtalks, at the top of the branches grow ſlender ſpikes like Arſmart, *with ſmall Flowers and Seed veſſels like Flax, but much leſs.*

55 55. Ros ſolis CHUSAN. perelegans, caule folioſo Muſ. noſt. 968.

This is a very peculiar ſort of Sun dew, *in having Leaves on the Stalks, which towards the top ramifie and Flower.*

We come now to the Trees which are as follows.

56 56. Abies argentea CHUSAN. foliis acutiſſimis.

This reſembles the Silver Firr, *but the Leaves are ſomewhat ſerrated and very ſharp.*

57 57. Acer forte CHUSAN. folio minore trifido.

Theſe Leaves very much reſemble the Acer Monſpeſſulanum I. B. *they are ſmooth above, and glaucous underneath, ſtanding on long ſlender reddiſh Stalks; the Fruit of this and the next I have not yet ſeen.*

58 58. Aceris folio arbor CHUSAN. virgulis ſpinoſiſſimis.

It's young branches are reddiſh, and very full of Bryar like Thorns, amongſt theſe Leaves inordinately grow the baſe of each pedicle, leaving an impreſſion like a V Conſonant on the Stalk; the Leaves have very much the face of the common great Maple *or* Sycamore *with long pedicles, whoſe baſe agrees with the branches.*

59. Alaternus CHUSAN. Arbuti folio Gazoph. Nat. 59
Tab. 36. Fig. Thea CHUSAN. floribus majoribus, fol. Alaterni ſerrato Muſ. noſt. 983.

By its Leaves and Flowers I at firſt took it for a Tea, *but having lately received it in Berry, I find it to be of another Family. The Leaves are ſtiff, ſerrated and pointed, generally thickeſt ſet towards the tops of the branches, from the boſom of theſe and below grow many ſmall Flowers cloſe to the Stalk, which are ſucceeded by little berries, that are both calyculated and pointed.*

60. Arbor CHUSAN. Frangulæ folio majore, ſub- 60
tus albido molli.

Altho' I have not yet ſeen the Flower or Fruit of this Tree, *yet I could not omit it becauſe, its Leaves are very diſtinguiſhable from any that have yet come from this Iſland, they ſeem eſpecially the young ones to have the texture and face on the upper ſide of our* Frangula *or* Alder berry, *yet ſomewhat ſofter, but its peculiarity is underneath, in being white, ſoftiſh, and having its middle vein ſpongy, and towards the Stalk ruſty coloured, as are its younger branches.*

61. Baccifera CHUSAN. Caryophylli aromat. folio, 61
Patsjotti flore.

Theſe Leaves reſemble thoſe of Cloves, *but ſomewhat thicker, are generally about an inch and half broad and three long, growing alternately; from the boſom of each comes three or four pentapetaloſe Flowers, ſomewhat like the* Malabar Patsjotti (Hort. Malab. *Vol.* 5.) *each filled with large curl'd like apices ending pointed, theſe are ſucceeded with black berries ſet in a ſmall* 5 *ſtarr'd* calyx, *its point one fourth of an inch, each ſtanding on an half inch Footſtalk. Out of one Berry I took,* 11 *from ano-*

ther near 20 ſmall ſhining brown Seed, of different ſhapes from their lying together.

26 62. Baccifera CHUSAN: Liguſtri facie.

Its larger wooly twigs are ſmooth, cinereous and ſpeckled, the ſmalleſt wooly, the Leaves grow by pairs, at the top come the Flowers looſely ſpiked, each in a ſmall cupt calyx; *the Berries leſs than Currans, black with a blewiſh caſt, each on a very ſhort footſtalk, and in an undetermined Cup, which ſeemed to want a part on one ſide, in each Berry is one large oval Kernel.*

36 63. Buxus CHUSAN. folio prælongo.

This has the face and texture of the common Box, but the Leaves are much longer, very narrow at the baſe, broadeſt near the middle, and blunt at the end.

46 64. Buxi affinis EMUYACA folio rugoſo.

The twigs are reddiſh and rough, as are the under ſide of the Leaves, but ſmoother above, they ſtand on very ſhort footſtalks, and have this particular, that the upper half of each Leaf *is ſomewhat lobated or largeſt, at the ends of the branches grow commonly two or more rough capſules, gaping like the* Fagaras, *each of theſe contains one or two black oval ſhining ſeed ſomewhat bigger than an Oat.*

56 65. Camphora Officinarum. The Camphire Tree.

To the Synonyms of this Tree mentioned in the Philoſophical Tranſactions, *No* 236. *p.* 39. *pl.* 35 *I ſhall only add the following,* viz. *Campre* Pomel *Hiſt. gen. des Drogues L.* 7. *p.* 246. *c.* 12.

56 *Caphura* Garz. & Acoſt. *Clus* Exot 160: & 258. *I. B.* prodr: 28. *pl.* 21:

Caphura quæ Salicis *folio dicitur I. B. V.* 1: *L.* 9. *c.* 54:
57 *p.* 338. *Fig.*

This the Arabians *call* Chafur *and* Chapur, *by ſome* Caphura, *it was known by* Avicen *and* Serapio, *but the ancient* Greeks *were ſtrangers to it,* Ætius *amongſt the Moderns takes notice of it, it is very well Figur'd, and amply deſcribed in* Breynius's *Century and firſt Prodromus.*

66. *Caſtanea* CHUSAN. folio fere ſerrato, ſubtus glauco: 66
The twigs are blackiſh with many ſmall warts, the Leaves grow inordinately (on ſhort pedicles) moſt of them more or leſs thorny, dented and ſome ſmooth, underneath they are glaucous and ſomewhat ſoft.

67. *Coccifera* CHUSAN. *Coryli* folio, floribus exiguis 67
racemiferis Gazophyl. noſt. Nat. Tab. 26. Fig.

Its twigs are ſpeckl'd, the Leaves of different magnitude and breadth, lightly ſerrated, ſtanding on an inch footſtalk ; at the top of each twig grows a ſmall racemoſe ſpike of little Flowers, which are ſucceeded by dry berries, growing like Currans.

I call ſuch Trees and Shrubs Cocciferæ *as have dry Berries, like the* Cocculus Indiæ *in oppoſition to thoſe, that are moiſt as Gooſeberries, &c.*

68. Coccifera Emuyaca Chamænerii folio, marginibus 68
criſpis.

The ſtalk of this is furrowed irregularly like Elder, its Leaves have the face and ſhape of a Willow Bay, but peculiarize themſelves by drawing their edges unevenly inwards, which ſwell the upper ſide and make them ſeem curl'd, their footſtalks are ſcarce half an inch, its Cocca *or* dry berry, *like the* Allſpice *or* Jamaica Pepper, *is ſet in a four or five ſtarr'd* calyx *in a looſe cluſter, each on a half inch footſtalk, between the outward Skin and Kernel (which is ſolid and very hard) is but little ſpace.*

69. *Criſta* Pavonis CHINENSIS Abrus folio. Boya- 69
hoa Herb noſt. Chin. Tab. 2. Fig. 4. Hoa *in the* Chineſe *Language ſignifies a Flower. The Leaves are much leſs and narrower than the* American kind, *otherwiſe in its Spines, Flowers and way of growing it very much reſembles it.*

70. *Cupreſſus* CHUSAN. Abietis folio Gazoph: noſt. 70
Nat. Tab. 6, Fig. 5. *where you may with its Figure ſee a deſcription of its Leaves and Seed, it bears its Cones ſingle at the end of each branch, the Scales of theſe, when they are open or crackt are ſerrated and rugged.*

71. Evonymo affinis CHUSAN. Fraxini folio, ſem. 71
nigro.

The Leaves grow oppoſite, and have generally three pair tail'd, i. e. *one at the end; the footſtalk very ſhort, and next the tail ſcarce any: The Fruit grows in cluſters, each husk rugoſe, including one black ſhining Seed.*

72 72. Fagara Emuyaca Fraxini folio.

This is diſtinguiſht from the next in having much broader Leaves, they grow oppoſite and are much like the Aſh; the Berries are about the bigneſs of Pepper, *and grow in ſmall Cluſters; the tender ſhoots and firſt ſprouts are prickly, in the more grown they are not ſo diſcernable. I have not as yet obſerved any prickles on the Leaves of this kind except in its firſt ſhoots, which are very ſmall and wear off as they grow older.*

I call thoſe Trees and Shrubs Fagaræ, *whoſe Berries ſplit like thoſe Figured by* Garcias ab Horto, *and from him in* Gerard Parkinſon, Cluſius *and other Authors, there are alſo theſe peculiars, which generally attend this Tribe.* viz. *the branches prickly and oftentimes the Leaves, on the under ſide and middle rib frequently, and ſometimes on both ſides and the leſſer veins; the berries ſplit in the middle and diſcover a black ſhining Seed, the outer skin rough, taſtes hot and ſpicey; the Leaves in all I have yet obſerved are perforated like* St John*'s* wort, Orange leaves, Myrtle, *&c. The* Hercules *and prickly yellow woods of the* Weſt Indies *are of this Family.*

73 73. Fagara CHUSAN. Fraxini folio anguſtiore:

The Leaves of this are not only narrower than the laſt, but prickly underneath, and are very thick ſet on the branches and between the Leaves.

74 74. Fagara CHUSAN. Rhois Virginianæ folio, caule alato. *What* chaw Chinens.

Theſe Leaves very much reſemble the Virginian Sumach, *with a winged or welted Stalk, with lightly ſerrated tranſparent notches.* Dr Sloan *has a fair ſpecimen of this in Fruit, which ripens in* October.

75. Frutex CHUSAN. Fagi foliis, fructu ſulcato.

75 *This very much reſembles* No 926 Muſei noſtri, *but is in all parts much larger, eſpecially its Leaves, which are very like the* Ca-

Carolina *Plant at* N^o 915. *in the ſame Century*; *Its Fruit grows naked at the top of the branches from a reverſt calyx, and is ſulcated like the capſule of an* Adhatoda.

76. Gelſeminum C H U S A N. fol. Betæ hirſuto. 76

The Leaves ſomewhat like Beet, but hoary, the Flower is leaved, in ſhape much reſembling the Roſe bay *or* Nerium, *the apices on each ſtamen ſeem double headed, the calyx is quinquifid and hoary, it grows ſpicated as I obſerved in a very large ſpecimen amongſt* Dr Sloans *dry Plants.*

77. Hedera arborea C. B. 305. 1. Phyt. 606. 1. C. B. in Matth. 466. Fig. 1. 77

Hedera Chabr. 115. Fig. 1. I. B. V. 2. L. 15. p. 111. Fig. I. B. prodr. 31. 4.

Hedera corymboſa Ger. 708. Fig. 1. id. emac. 858. Fig. 1 Lob. obſ. 336. Fig. 3. Lob. 1. c. 614.

Corymboſa Hedera communis Lob Advers. 269. Ray. H. Pl. 1505. 1.

I can ſee no difference between this and our common Tree Ivy.

78. Spurge Laurel. 78

Laureola Ger. 1404. Fig. Ger. emac. 1219. Fig. Park. 205. Fig.

Laureola ſempervirens fl. viridi, quibuſdam Laureola mas *C. B.* 262. 1. Sempervivens fl. luteola I. B. L. 5. p. 564. Fig. 1 1. B. prodr. 17. pl. 4.

Chamædaphnoides & Laureola Chabr 45. Fig. 3.

79. Lycium C H U S A N. Pruni minoris folio. 79

The Twigs of this end in a Thorn, the Leaves are like the Slow, but leſs, finely ſerrated growing inordinately on very ſhort Stalks The Berries are black and wrinkled like Pepper, and of that bigneſs, they ſtand on a ¼ *inch footſtalk in a ſmall round Calyx, under the thin outer Skin lyes one or two Kernels which the Furrow of the Berry diſcovers when the laſt.*

80. Mandaru forte C H U S A N. fol. acuminato alte bifido: 80

The Leaves which are all of this Plant I have yet ſeen, ſeem to be of the Malabar *kind of* Manduru, *this is different from 3 or 4 ſorts, I have already from thoſe parts, its more pointed, deep cut, and glaucous underneath; I will give a Figure of it as ſoon as I receive it in Flower and Fruit.*

81 81. Mori facie CHUSAN. folio ſubtus molli ferrugineo.

82 82. Ou tum chu P. *le Compte.*

Gou tum ſhu Herb. noſt. CHINENS. pict. Tab. 6. Fig. 1. & Gazoph. Nat. Tab. 27. Fig.

Outumchu CHINENS. folio trifido, patalis bacciferis.

This is a wonderful Tree and very particular in the product of its berries (which I take to be the Fruit) and is after the following manner as I obſerved it, viz. *The Flowers grow on its own Branch* (i. e. *ſeparate from its Leaves) in a large looſe or ſparſt Tuft, after the manner of* Fraxinella *or* Dittander, *from the larger Stem each little one has many Flowers, compos'd of 5 broad green* Petala *or Leaves like thoſe of our* Adders-Tongue, *every one ſtanding on an half inch pedicle ſtarwiſe, on both the Edges of theſe grow one or more Stalkleſs Berries, of the bigneſs of Holly, rugged now dry, I opened one of them, it had a large white Cavity and a ſmall decayed ſubſtance only remained in it.*

83 83. Paliurus Emuyaca major, fol. rotundiore.

This ſeems to differ from our European *ſort in having its Leaves much larger and round.*

84 84. Palmæ Chriſti vulgaris facie, Frute CHUSAN. caulibus & foliis pubeſcentibus.

Theſe Leaves have the ſhape of the common Palma Chriſti, *but are ſomewhat hoary as are its Stalks and Branches; I obſerve this in it particular, very near the baſis of the Footſtalk of each Leaf it hath 2 long and very narrow Threadlike Auricles,*

85 85. Pimenta CHUSAN. folio Alaterni Gazoph. Nat. Tab. 26. Fig.

The

Thea CHUSAN. floribus minoribus fol. Alaterni cuſpidato Mus. noſt. 984.

Its Leaves ſtand on ſhort Footſtalks are pointed, ſtiff and ſomewhat notcht, from the Boſom of theſe and at the top of the Branches come forth many ſmall Flowers, full of Stamina, like the Tea but much leſs, which made me conclude it was of that Family; but Mr Cunninghame *hath ſince ſent it me in Fruit, which I find a ſmall dry Berry of an oval bottled ſhape coronated ſomewhat like a Clove*

86. Popnli facie CHUSAN. folio ſubtus molli ferrugineo.

This has the ſhape, thickneſs and ſoftneſs of Abele *Leaves, but inſtead of white is ruſty coloured underneath.*

87. Quercus CHUSAN. Caſtaneæ folio pubeſcente. 78

The Stalk and underſide of the Leaves are hoary, its Catkin *or* Julus *round and echinated as Mr* Cunninghame *ſays, but its Acorn ſmall and ſmooth.*

88. Rhamnus Emuyacus maritimus fl. ceruleo. 88

The Leaves like Sea Purſlain but ſmaller and near Stalkleſs, from them towards the top of the Branches come 2 or 3 pentapetalous or 5 Leaved Flowers, ſet in a like divided calyx, the footſtalks of ſome of them are near half an inch.

89. Rhus Emuyaca fol. ſerrato ſubtus molli, rachi alato. 98

Some of theſe Leaves are broader and more or leſs ſerrated than others, the Stalk is larger or ſmaller wing'd as the Twigs are older or younger: Mr Cunninghame *ſays they eat the Berries which are ſower and have a Dew on them, he farther obſerves that from the broaken Branches there iſſues out a Turpentine-like Balſamick Liquor.*

90. Ricinus CHINENSIS ſebifera Populi nigræ folio Gazoph. Nat. Tab. 34. Fig. 3. & Muſei noſt. 965. Kieu-yeu P. Martini in Atl. Sinens: Arbor Sebacea P. le Compte. 90

Arbor Sinenſis pinguedinem Sebi inſtar ferens Jonſt. Dendrolog. p. 42. 12.

The Leaves grow alternately on long ſlender footſtalks, ſome of them much extended in the middle and very ſharp pointed: The Flowers are yellow, mighty ſmall, and grow in a ſlender Catkin like thoſe in Hazel: The Fruit whole is about the bigneſs of a midling Nut, ſmooth, blackiſh and triſulcated, opening into three parts diſcovers as many white Seed, from whence and its Kernels I ſuppoſe the ſuet or fat is produced; each being covered with a white fatty body, under which is a brown hard ſhell containing an unctuous Kernel, which by bruſing turns almoſt wholly to an Oyl.

Mr Sam. Brown *firſt ſent me this ſome years ago from* China, *ſince which I have received it from* Emuy *and* Chuſan. *There are two young Trees of this now growing* Sept. 27. 1703. *in the* Charter-houſe, *rais'd this year by Mr* Cole *Gardiner of that place.*

91 91. Ricinus ſorte CHUSAN. Tiliæ folio.

Theſe Leaves grow alternately on footſtalks, ſome above two inches long, of the bigneſs of the Mulberry *and* Lime Tree, *but not ſerrated; at the top grow ſpikes of thrummy Flowers, like the common* Palma Chriſti, *but cloſer ſet. I hope the next Ships from* Chuſan *will bring me it in Fruit, and then I ſhall give a farther deſcription of it.*

92 92. Thea CHINENSIS vera potulenta Gaz. Nat. Tab. 21. Fig.

Chaa C. B. 147. 7. Chaa herba Japoniæ I. B. V. 3. L. 27. p. 5.

Evonymo adfinis arbor Orientalis Nucifera, fl. Roſeo Pluk. Phyt. Tab. 88. Fig. 6.

Frutex Thee Bont. Hiſt. Nat. L. 6. p. 88. Fig.

Herba Te Thee Sinenſe Joncquet ſtirp. offic. obſcur. p. 25.

Styraci & Evonymo media affinis, The Sinenſium. ſ. Tſia Japonenſibus fl. ſimplici Breyn. prodr. 2.

The Sinenſium Tſia Japonenſibus Breyn. Cent. 111. c. 52. & Excerpt. ex obſervat. Will. ten Rhyne de Frutice Thee Ejuſd. Cent.

The s. Thea Indorum & Chinenſium Worm: Muſ.: 165. Fig. Folij.

Thea Officinarum Dale Pharm. 472. Ray H. Pl. 1619.

Thee Pomet Hiſt. gen. des Drogues pt. 1. l. 5. p. 143. c. 5. Fig.

The principal Authors which have given us the Deſcription, Vertues, Culture, Curing, &c. *of this Shrub, are* Bontius, Breynius, du Four, Ovington, Pecklin, Pomet, Ray & Tulpius.

93. Thea CHINENSIS Pimentæ Jamaicenſis folio, flore Roſaceo ſimplici Gaz. noſt. Nat. Tab. 33. Fig. 4. 93

Swa Tea s. Cha hoa *Chinenſ.* Herb. noſt. Chin. pict. Tab. vi. Fig. xi.

Hoa *in the* Chineſe *Language ſignifies a Flower; and this Plant has a very beautiful one, for which reaſon and the variation of them (ſome being ſingle and of a deep red as this, others white and ſome ſtrip'd, there are alſo of theſe Colours with double Flowers) they and the* Japoneze *keep them as an Ornament in their Gardens.*

Of theſe Leaves ſome are rounder, others pointed, they have the ſhape and ſtiffneſs of the All-ſpice or Jamaica *Pepper, are ſomewhat ſerrated and grow irregularly on ſhort thick footſtalks, the young Flower-bud is ſcal'd like a Cone, when larger the* ſquama *are whitiſh and Velvetty, except the edges which are brown and tranſparent. The Flowers deep red, 5 Leaved and as big as a ſingle Roſe, and like it full of threads with yellow apices or heads. The Fruit about the bigneſs of a Cheſnut, ſomewhat triangular, including under a very thick woody ſhell ſeveral Seeds diſpoſed into 3 Cells. It Flowers in* February.

94. Thymelea CHUSAN. Cydoniæ folio. 94

The Flowers are like Jaſmin, *but 4 Leaved, its Tube or Neck hoary and about half an inch long.*

95. Thymelea CHUSAN. Myrti Roman folio. 95
96. Vitis CHUSAN, trifido folio. 96
97. Vitis CHUSAN. fol. parvo molli.

A Deſcription of theſe 3 laſt and ſome others, with their Figures, &c. *ſhall be the ſubject of another Paper.*

III. *Part of a Letter from Mr* Anthony van Lewenhoek, *F. R. S. containing his Obſervations on ſome* Animalcula *in Water, the diſſolution of Silver,* &c.

Delft in *Holland*, Feb. 5. 1703.

ABout the latter end of *July*, ſtanding on the Bank of the *Canal* that is before my Houſe, and obſerving the Water, which gently flows thro' our Town, and which is very clear, and almoſt of the colour of the *Maeſe* Water, I ſaw ſomething ſhining in it, and being deſirous to know what it was, I took a Glaſs Tube of almoſt a Foot length, and of a Fingers breadth, and tying a String about it I let it down into the Water perpendicularly till it was quite full.

Looking upon this Water with a Microſcope, I obſerved ſeveral ſorts of Animalcula Swimming therein, ſome of which I don't remember I had ever met with before.

I view'd this Water ſeveral times in one day, but could not find out the ſhining Matter which I had ſeen in the Canal.

On the 4th of *Auguſt* I made my obſervations again, and then I could ſee in 8 or 10 places ſeveral ſmall Particles ſticking ſo faſt to the ſides of the Tube, that altho I put the ſaid Water into a gentle motion, I could not remove them.

This induced me to view the ſame with my Microſcope, and then I could plainly ſee thoſe Particles, repreſenting a large Bough or Branch of a Tree, with a great number of Sprigs about it.

Moſt of theſe Branches were faſtned with their Stems to the ſides of the Tube, and ſeem'd to ariſe out of a very ſmall Particle of Matter that was likewiſe ſo faſtned.

That I might be farther ſatisfied herein, I took another Tube that was longer and broader than the firſt, and fill'd it with the ſame Water, having firſt rinced it once or twice. I viewed this Water alſo ſeveral times, after it had ſtood 30 hours in the Tube, and again diſcovered the ſame ſort of Boughs as compleat and perfect as if you were to ſee the ſame with your naked eye on a Tree, and amongſt others one in ſuch a poſition, as if the thick Branches from whence the reſt proceeded, lay juſt againſt my Eye.

Before this laſt Particle I placed a Microſcope, with a deſign to obſerve from time to time whether it would encreaſe in bigneſs.

After the ſpace of ſix hours I could not find that it was grown any bigger, and I obſerved that the ends of the Twigs, which were about twenty, were laden with little tranſparent Bubbles, whoſe Diameters were thrice as big as the extreme parts of thoſe Twigs.

Now having likewiſe obſerved about the ſaid Twigs a ſort of Tranſparent Animalcula of the ſame ſize with thoſe Bubbles,I did ſuppoſe that the before-mentioned round Bubbles were the ſame with thoſe Animalcula that had taken their ſtation on the ends of the Twigs; and I was confirm'd in that opinion when I perceiv'd the next day in the morning, after that the Water had been 48 hours in the Glaſs Tube, that moſt of theſe round Bubbles were off the Twigs, and that a very few of the Animalcula were got upon the Twigs, and remain'd there immovable, whilſt I made my obſervations.

Twelve hours after this I could not ſee that the foreſaid Branches were grown larger; but I then obſerved that ſeveral of the ſmall Twigs were again inveſted with round Bubbles, and an Animalculum that was about fifty times as big as one of the Bubbles,was running on one of the Branches; and foraſmuch as the end of one of the Twigs, where that Animalculum had been, was again laden with the ſaid Bubbles, I concluded, tho I had no ocular proof of it, that

the

the ſaid Animalculum had dropt her young ones there.

On the 6th of *Auguſt* I took another Glaſs Tube of above a foot long and an inch in diameter, one end of which was hermetically ſeal'd, that there might be no cauſe of ſuſpicion that theſe branches or twigs proceeded from the Cork; and having rinced the ſame two or three times, I ſet it on my Desk, and viewed it ſeveral times, but could perceive no Branches till after the Water had ſtood above 40 hours in the Tube; after which I took a Microſcope and faſtn'd it to the Tube, to ſee whether the Branches grew any bigger after the firſt diſcovery of them, but as nicely as I viewed them I could perceive no alteration.

Now I could ſee on the extream parts of the ſaid Twigs 3 or 4, or ſometimes 5 round Bubbles like Roſes by one another, which was a very agreeable ſpectacle, for when one of theſe Branches (which was only faſten'd to the Glaſs by its thickeſt end) came to be removed by that ſmall motion into which I put the Water, all the five ſmall Twigs were likewiſe put into motion, and the ſame motion was likewiſe imparted to the Bubbles, tho ſome of their Stalks were ſo exceeding ſmall that I could not ſee how they were joyn'd to the ſaid Twigs.

I pour'd out the Water very gently from the Glaſs Tube, with intention that the Branches which were faſten'd by their Stems only to the ſides of the Glaſs (whilſt their Twigs were kept in a continual motion by the Water) might lye along on the Glaſs, to the end that my Limner might draw them the better.

Fig. 1. A B C D E F Repreſents the ſaid Particle as it lies on the ſide of the Tube.

A. Shews you the Stem or Root of the ſaid Branch, and whereby it was joyned to the ſides of the Glaſs.

Here you may ſee what a vaſt number of Branches and Twigs there are in this ſingle Figure, which indeed appears irregular upon the Paper; whereas in the Water where they were unravell'd and could play free, it was a very agreeable ſight, being in colour like Oak, and in ſeveral places beſet with round Bubbles, juſt as if they were compos'd of ſuch Particles.

G and D repreſent ſome of theſe Particles of the Figure of a Roſe, which ſeem to conſiſt of round Bubbles, as alſo H. tho the Stalks of them are ſo fine that I could not perceive them to be united to the main Branch, however when that mov'd they mov'd alſo.

As ſoon as the Water was pour'd out of the Glaſs Tube I immediately viewed the ſaid Branch, and between two of the Sprigs B D and B E, I ſaw two of the ſmall Animalcula ſwimming in the little Water which remained unexhaled amongſt the Twigs, and their Figure was like the Bubbles that were deſcribed by H. During theſe my obſervations I diſcovered an exceeding ſmall Particle breaking off from one of the Particles or Bubbles under the ſaid letter H. and preſently ſwum off with a ſmall motion, but the whole ſpace of its progreſs was not above a hairs breadth ; the ſaid ſmall Particle was certainly an Animalculum, for I could plainly ſee it turn and wind it ſelf about ; I obſerved a little motion alſo in another of theſe Particles or Bubbles, that I have ſaid before were like a Roſe, but that Particle remain'd ſtill entire.

On the ſides of the ſame Tube lay ſeveral other ſmall Branches, but they were not ſo perfect as the firſt Figure, and when the Water was pour'd out, they appear'd like Fig. 2. I K L and Fig 3. M N O.

What ſhall we ſay concerning theſe Boughs or little Trees ? We can't imagine that they proceed from a Seminal Matter in the Water, but rather with ſubmiſſion to better Judgments, that they are compos'd of that Matter which ranging in ſmall Particles thro the Water, does by a kind of natural inclination cement or coagulate into one body ; and this will not ſeem ſtrange to any one who has ſeen the like experiment in the fileing of Iron, for if you apply that part of the Iron that is filed and remains ſtill warm to the Filings, it will immedimediately attack the ſaid Fileings, and they ſhall hang down like a Chain from the Iron ; nay, if you apply theſe Fileings to a Magnet, the Attraction will be much ſtronger.

Now I am ſpeaking of Inclinations, I can't forbear acquainting you, that I have ſeveral times for my diverſion diſſolved Silver in *Aqua fortis*, and as ſoon as I put the Silver into the Menſtruum have endeavour'd to obſerve the operations, and have always found a great number of Air-bubbles ariſing from the Silver, which before they were ſeparated from the Metal were as large as a common pins head, or as a grain of Sand.

Theſe Air-bubbles, as ſoon as they left the Silver, and in proportion to their mounting toward the ſuperficies of the Water, grew leſs and leſs, inſomuch that they did almoſt eſcape ones ſight, and preſently after vaniſht entirely, and this change happen'd uſually in the ſpace of three Pulſes : Some of theſe Air-bubbles laſted a little longer, others again, tho as big as a Pins head, burſt in pieces before my eyes, without leaving other and ſmaller Bubbles (part of themſelves) behind them.

For my farther ſatisfaction in this matter, I prepar'd a Glaſs Bottle, whoſe Axis was an inch and half large, of the ſhape as is delineated by Fig. 4. a, A B C D E F G, whereof A B C D repreſents the great Bowl or Globe, and A D E G the leſs, and F. the Bore or Orifice of the Glaſs.

This Glaſs I placed ſloping as in the Figure, after that I had firſt fill'd it a little above E G with *Aqua fortis* whilſt it ſtood perpendicularly ; and then I put into it two grains of fine Silver which lay at the bottom of the Glaſs, in ſuch proportion as is expreſt in the ſaid Figure at B. whereby all the Bubbles proceeding from the Silver muſt aſcend perpendicularly to C ; with this perſwaſion, that when the quantity of Air that was extracted from the Silver ſhould arrive at C. it would remain there, and that in proportion to the ſpace that the ſaid Bubbles ſhould poſſeſs there, ſo much of the *Aqua fortis* would be protruded from the greater Bowl to the leſs.

Now when I ſaw that but very few more Bubbles aroſe from the Silver, I could perceive very plainly that moſt of thoſe Air-bubbles that had been extracted, did not only grow leſs before they arrived at C, but were quite vaniſht.

Now that the Silver was viſibly united to the *Aqua fortis*, and had remain'd ſo 24 hours, there was as much Air in the Glaſs at C. as would fill the ſpace of 3 or 4 Pins heads; whereas there aroſe ſuch a vaſt number of Air-bubbles from the Silver during its diſſolution, that I was amaz'd what was become of them, ſeeing they were in a manner vaniſht, without leaving any Traces behind them.

I caus'd the Air in C. to diſlodge out of the Orifice F. by raiſing the Glaſs perpendicularly, and then I threw in three times as much Silver, whereupon an unſpeakable number of Air-bubbles continually aſcended towards C. but were diſpatch'd before they could arrive at the top, and ſuch of them as were bigger, and held out till they came to C. did then burſt in pieces, without leaving any marks behind them, except always as much Air as would fill the ſpace of three or four Pins heads.

Furthermore, I put 30 grains of Silver into the ſaid Water, without obſerving any more remarkable difference, ſave that there remain'd at C. as much Air in bigneſs as an ordinary Pea.

In theſe my obſervations I have likewiſe taken notice, that the larger the Air-bubbles are, which ariſe from the Silver, the faſter they mount towards the top of the Glaſs; and this has place alſo I imagine in that air which the Learned call *Aer Subtilis*, *viz.* how much the larger the Particles of Air be that perſpire from our bodies, the faſter they aſcend; and ſo likewiſe in the deſcent of all heavy bodies towards the Earth; as for inſtance, take two Iron Balls, one of an Inch in diameter, and the other of 5 Inches, and let theſe two Iron Balls fall at once from a certain equal heighth, my poſition is, that that Ball whoſe Axis is 5 Inches, muſt cut thro a Column of Air 25 times greater than the Column of Air thro which the one Inch Ball paſſes; this being granted, I ſay then, that as thoſe two Columns of Air thro which the Iron Ball muſt paſs, are as 1 to 25, ſo the Gravitation of the ſaid two Balls are as 1 to 125.

Now that Ball which being 125 times heavier, and paſſes thro a Column of Air that is but 25 times bigger than the other, muſt needs, I ſay, move quicker in its deſcent than the leſſer Ball, ſo conſequently muſt thoſe Particles (ſuppoſing them to be compos'd of the ſame Matter) that are biggeſt, firſt and ſooneſt perſpire thro our Bodies.

But to return from this digreſſion, having firſt weaken'd ſome of this *Aqua fortis* thus impregnated with Silver, I put a little of it in a clean Glaſs Tube, and now and then threw into it a little Copper of the bigneſs of a grain of Sand, and then viewing my Silver water with a Microſcope, I obſerved with a great deal of pleaſure, how the Silver in this clear Water was coagulated into ſuch bodies as are deſcribed by the above-mentioned Trees; which Coagulation we may call an Inclination; and that I may give you a better Idea of this kind of Coagulation, I caus'd the Painter to deſcribe a ſmall Particle of the Silver no bigger than a large Sand, *vid.* Fig. 4. P. Q. R. S. T.

I was amaz'd to ſee in a few ſeconds of a Minute, ſuch Coagulation of branched Particles (which even thro a good Microſcope were inviſible) ariſing from a ſeeming clear Diaphanous and Liquid Matter.

Now what ſhould occaſion ſuch a Coagulation, inſomuch that no Silver ſhall remain in the Water, is to me wholly inſcrutable.

From theſe Coagulated ſmall Silver Particles, my thoughts made an excurſion to the rich Silver Stone which comes to us in ſmall fragments from the *Weſt Indies*, and which the Virtuoſo's keep as Rarities in their Cabinets, of which alſo I have a little.

Now if we ſeriouſly conſider the Silver in that Stone, we ſhall alſo find that its Particles are coagulated in juſt ſuch branches as appear'd in the aboveſaid Water by the help of my Microſcope, from whence I am the more fully confirm'd in my hypotheſis, that when the parts of that Stone were a fluid ſubſtance, the Silver Particles were alſo mingl'd with them, and when the Stone came to conſolidate, the Silver alſo was coagulated in Branches juſt as we ſee it now lying in the Stone, wherewith it is ſurrounded, and as it were impriſon'd; from whence ſeveral have conceited that in proceſs of time the Silver grew in the ſaid Stone.

In the *Philoſophical Tranſactions* No 243. *p.* 298. I obſerve that Sir *Robert Southwell*, a Member of the *Royal Society*, had acquainted that Body, that he had ſeen a Gold Ducat beaten very thin, and then diſſolv'd in two Ounces of *Aqua Regia*, into which was ſteept a Linnen Rag and then dried, and then ſteept again, and as often dried, till it had ſuckt up all the ſaid Water; after which they burnt the Cloath to Tinder, and ſo gilded the Silver, by rubbing it with the Aſhes or remaining matter of the ſaid Linnen.

I took a piece of Gold and threw it into a proportionable quantity of *Aqua Regia*, in the diſſolving of which I ſaw Air-bubbles aſcending in like manner as I ſaid before of the Silver.

After a little time I took ſome of the *Aqua Regia* thus impregnated, and laid it on a clean Glaſs, to obſerve, after the mingl'd Salts were coagulated, what Gold Particles I could diſcover therein.

When it was fair warm weather the Salts were for the moſt part coagulated, but in ſo many ſeveral ſorts of Figures that they were hardly to be accounted for, ſometimes they repreſented an exact Hexangular Figure, by and by the very ſame Figures were no leſs irregular; the occaſion of which was, as I conceive, becauſe the Coaleſcence of new Particles was not equal on every ſide; but that which was the moſt remarkable was, that upon theſe Salt Particles, that were as tranſparent as yellow Cryſtal, there lay other Salt Particles of a fine Gold colour, and ſometimes they appear'd to me as if theſe fine Gold colour Salts were ſhut up in the other ſalt Particles, which caus'd a very agreeable Phœnomenon; but when the weather grew damp and moiſt, all the Cryſtal Salts were melted, and the Gold-colour Salts were mixt with the common Particles.

I took another little piece of Gold that had been workt by a Goldſmith, and having beaten it very thin, I put it into the ſame Glaſs where my other Gold had been, with *Aqua Regia*, and obſerv'd that a white Subſtance was ſeparated from it and ſubſided in the bottom of the Glaſs; for we know that as *Aqua Fortis* diſſolves Silver, whilſt the Gold eſcapes untoucht, ſo *Aqua Regia* diſſolves Gold, without affecting the Silver at all.

Hence I infer, that that Gold was alloy'd with ſome Silver, which was the White Subſtance, ſeparated, as I ſaid before, whereas according to our Laws the Wrought-Gold ſhould conſiſt of 22 Carats.

The Piece of Gold that lay in the *Aqua Regia* would not be united with it; whence I concluded that there was too much Gold and too little Water, for I had made the Glaſs ſo hot that I could not bear it with my hand.

Moreover, I took a ſmall piece of Copper and put it into *Aqua Regia*, where a little Gold had been already diſſolved, and preſently obſerved that the *Aqua Regia* began to operate upon the Copper, as if it had lain in *Aqua Fortis*; the Gold alſo cemented with the Copper, but in much ſmaller Branches than Silver in *Aqua Fortis*; and I ſaw that the Gold coagulated ſo ſtrongly with the Copper, that the Water about the ſaid Copper was quite diveſted of its Gold colour; and after an hours time the Water was ſo impregnated with the Particles of the Copper that it aſſumed a Green colour, and then one might perceive with the naked Eye the Gold that lay about the Copper.

Again, I took other *Aqua Regia*, that was impregnated with ſo much Gold that it could diſſolve no more, and obſerved that the coagulated Salt-particles were of an extraordinary

traordinary fine Gold colour, and very agreeable to the ſight, being compoſed of exceeding ſmall Particles, and the Corners or Angles very regular.

I placed theſe Salts before my Microſcope, that I might impart to others alſo the diverting ſpectacle, and all that ſaw it own'd they had never in their lives ſeen ſo fine Gold; and it ſeem'd of ſuch a Figure and Texture as if it had been a Piece of Gold newly taken out of the Mines.

Now, in order to expoſe to view the Coagulated Salt Particles in their firſt Coalition, I put the ſaid Water impregnated on a clean Glaſs, and then caus'd part of it to run off the Glaſs again, that the remainder might lye as thin as poſſibly in the Glaſs without touching it, imagining that the ſaid Water lying thus thin, the Salt Particles might Coagulate the more regularly; and I obſerved afterwards that moſt of thoſe Salt Particles were hexangular,tho ſo exceeding ſmall that they did almoſt eſcape the ſight, and many of them were regular Hexangles. See Fig. 5. A B C Fig. 6. D E F Fig. 7. G H I Fig 8. K L M and Fig. 9. N O P.

Moſt of theſe Figures were as tranſparent as Glaſs, and all of them were ſurrounded with a Liquid Matter that was ſomething upon the Gold colour, the which Matter did not exhale, tho the weather was very warm and dry.

Moreover, I ſaw an unſpeakable number of Particles ſo exceeding ſmall that their Figure was not diſtinguiſhable, tho I did believe them to be Salt Particles likewiſe; the rather, becauſe I could not obſerve any of theſe ſmall Salts lying near the aforeſaid great ones, which thro the ſympathetical Inclination of homogeneous Bodies, I did conclude to be compos'd of a Congeries of ſmall ones.

I ſaw alſo other Particles that were not at all Pellucid, which I ſuppoſe were ſurrounded with ſo many Gold Particles, that they were not only of an irregular Figure, but alſo opake.

Many of theſe Salt Figures were more protuberant in the

Cir-

Circumference than in the middle, and had alſo ſeveral Rings or Circumferences, which does ſtill the more confirm me in the opinion of thoſe ſecret Inclinations of like Bodies, and thus in their increaſe they preſerve the ſame Figure which the ſingle Salts had put on at their firſt Coagulation.

Into ſuch Water I alſo put a little piece of Copper, and obſerv'd that immediately the Gold had partly united itſelf to the Copper, but the *Aqua Regia* had not ſo much power over the Copper as to protrude out of its ſubſtance ſo many Air-bubbles, as it might otherwiſe have done if there had not been ſo much Gold therein; the ſaid Water had thereupon aſſum'd a greeniſh colour, and all the yellow colour was turn'd into Coagulated Gold, inſomuch that one might with the naked eye diſtinguiſh the Gold from the Copper, particularly the extream parts of the little Boughs which were made by the Coagulated Gold, altho the ſaid Coagulated Gold conſiſted of Particles that were ſo very ſmall and minute, that they did not appear larger with the help of a good Microſcope than the ſmalleſt grains of Sand to the naked Eye.

When I weaken'd with Rain Water the *Aqua Regia* which had been impregnated with a great deal of Gold, and then put into it a bit of Copper, I obſerv'd that the Gold in a ſhort time was coagulated or united with the Copper, and that the Water was turn'd to a light green:

I have alſo obſerv'd that the ſmall Twigs of theſe Coagulated Particles were not of a fine Gold colour, from whence I inferr'd that there was Copper blended together in them.

The ſaid *Aqua Regia* which had been impregnated with Gold, having remain'd ſome days in the Glaſs, I perceiv'd that where it was thickeſt, it was covered with a Film or Skin, and that moſt of the Salts when the Weather was not warm, nor the Sun ſhin'd, were diſſolv'd, and much more in Rainy Weather.

Moreover, I expos'd the Glaſs with the ſaid Water to ſuch a heat of the Fire that the Salts evaporated in Smoak, and that part of the Glaſs where there lay leaſt of the *Aqua Regia*, aſſumed a colour that was ſomething upon the red, but where the ſaid Water lay thicker together, we could not ſee the fine ſhining Gold with the naked Eye, but when we rais'd that Glaſs, where the Gold lay higher to the light than the Microſcope, I ſaw that the Gold Particles were not united with the other, but now and then Coagulated into Branches, and where the Gold Particles were not thus Coagulated they were ſo very ſmall, that how nicely ſoever I viewed them they eſcaped my ſight; and tho there lay together more than a thouſand Millions of theſe ſmall Particles, all of them did not make a body that was bigger than one ſingle grain of a large Sand.

Where this Matter lay thin and diſpers'd, I obſerved that the ſmall Particles thereof were ſuch ſolid and compact bodies, that did not admit of the leaſt Rays of Light; and where they lay ſingle I ſaw other Particles yet ſmaller, whoſe Bodies were more looſe, but I imagined theſe laſt to be ſome Particles of that Matter, which the *Aqua Regia* had left behind it.

Now after that the ſaid *Aqua Regia* had remain'd on ſome of the Glaſſes ſeveral days, and the Salt Particles for the moſt part were changed into a fluid Subſtance, I obſerved among ſeveral of the Coagulated Branches ſmall diſtinct Particles, which I fancy to be Gold, tho I could not for the ſmallneſs perceive the colour of them.

To ſatisfy my ſelf herein, I took a ſmall Glaſs Bubble, with as much *Aqua Regia* impregnated with Gold, as was equal to ſomething more than a great Pins head, and ſet it over ſuch a ſtrong Fire, that both the Glaſs and Gold were upon the melting, then viewing the Glaſs I ſaw very plainly that a ſmall portion of the ſaid Gold was Coagulated into Branches, and that theſe Coagulated Particles were round knobs or bubbles.

Theſe Gold Bubbles were diſperſt in great numbers over the whole Glaſs, in ſome places cloſe together, in others thinner, of different magnitudes, and many of them ſo ſmall, that altho I view'd them thro a good Microſcope they did in a manner eſcape my ſight; inſomuch that it is almoſt impoſſible for a man to conceive, unleſs he has had ocular proof and demonſtration thereof, that ſuch vaſt numbers of Gold Globules could proceed from ſo ſmall a quantity of Matter, and who knows how many more Gold Particles muſt coaleſce in melting, to compoſe one of theſe ſmalleſt Globules.

Now tho the ſmall Gold Particles could not be diſcover'd when they were ſurrounded with *Aqua Regia*, we could eaſily ſee the ſhining Gold colour of them all, now (ſaving only the very ſmalleſt Globules) which was no unpleaſant ſight, for they all appeared like ſo many compleat round Pellets.

In my former Letter I affirm'd that that green ſtuff is found upon ſtill Waters (which we alſo call *Duck weed*) did not ſpring from the Ground, but from Seed within it.

But now in Winter, when thoſe Ditches, in which I had ſeen much of this green Weed, were covered with Ice, I ſaw but a very little of it, and what I ſaw was very ſmall of Leaf.

Having conſider'd this, I thought it might be poſſible in warm weather for thoſe green Weeds to ſpring from the Earth, tho it did not feed upon the Ground, nor encreaſe in bigneſs there.

For ſuppoſing as it really happens, that theſe Weeds in warm Weather by the rarefaction of thoſe Particles of Air in their Veſſels are driven up to the ſuperficies of the Water, the ſame Weeds by the contraction of the Air in cold Weather will grow heavier than the Water, and conſequently ſink to the bottom, and according to the change of the Weather, will have their viciſſitudes of emerging or ſubſiding.

This riſing and falling of the green Weeds may ſeem ſtrange to ſome people, but if they will be convinced by the Experiments of natural Philoſophers whom I have followed ſeveral years, let them take a ſmall Glaſs-bubble, ſuch as is deſcrib'd by Fig 10. Q R S T, leaving the ſmall orifice at T open for the Water to run in and out, and let this Bubble be put into a Veſſel with Water, they will find in Summer that by the dilation of the Particles of Air within the ſaid Bubble, it will riſe to the ſuperficies of the Water, whereas the ſame Air, thro its elaſticity, being contracted in cold Weather, will make room for the admiſſion of a Maſs of Water ſo much heavier than itſelf into the ſaid Bubble, and then it will ſubſide; and this will happen *toties quoties*.

IV. *A Letter from the Reverend Mr* William Derham, F. R. S. *to Mr* John Haughton, F. R. S. *containing his Obſervations on the Weather,* &c. *for ſome years laſt paſt.*

Upminſter, April the 5th, 1703.

I Lately ſent my Weather and Tables of laſt year to Dr *Sloane*, and promis'd when I ſhould hear from Mr *Towneley* in *Lancaſhire*, an Account of what he wrote that was curious: I have lately receiv'd Mr *Towneley*'s Letter, and take the occaſion of that Letter to write now to you, to give you my hearty thanks for all favours that I have receiv'd from you; as well as to ſend you ſome of that ingenious, curious Gentleman's Obſervations of laſt year, and my own.

And firſt, As to the moſt remarkable Weather, eſpecially Rain, of laſt year, and the effects thereof: Mr *Towneley* tells me, that it is a general complaint in the North of *Eng-*

land, that there were but ſmall Crops of Hay, which calamity befel the Southern parts alſo; the cauſe whereof may be perceiv'd by the following firſt Table of Monthly Rain; in which you may perceive the growing Months of *March* and *April* to have been dry Months in *Lancaſhire*, and *May* no wet Month, conſidering the quantities of the other Months, and of other Years publiſh'd heretofore in the *Philoſ. Tranſ.* Here at *Upminſter*, *April* was fortunately a wet Month, till the 23d, or elſe, no doubt, we ſhould have ſuffer'd more than we did in the want of Hay; for the growing Month of *March* was a dry Month, by the following Table; and *May* (which by the ſame Table ſeemeth to have had near a due quantity of Rain) was a very dry Month by the Tables ſent to Dr *Sloane*; for it appears by them, that very little Rain fell from *April* 23 till *May* 29, and then fell in great Showers, the greateſt quantity of that Months Rain. Mr *Towneley* doth not tell me particulars, but I gueſs it to be after this manner with them in the North of *England*; for beſides that *March* and *April* were dry Months with them, and *May* ſomewhat more wet, yet probably the wet of *May* did not fall early in *May*; for it appears by the following Table the third, that the Mercury was high, and in ſomewhat a fix'd Station on *May* 13.

Thus much for the Weather in the Spring-Months of the Year 1702. and the effects it had on Hay, which effects I have ſome reaſon to think extended to many parts of this Kingdom, beſides thoſe already ſpoken of.

As to the other Months there is little remarkable, beſides the vaſt diſproportions of Rain between *Lancaſhire* and *Eſſex*, which I ſhould ſcarce take notice of, if it was not what happeneth almoſt every year, as will appear by the following Table 1ſt, which I now ſend to compleat what hath been publiſhed in former years in the *Tranſactions*; the cauſe of this I cannot judge of, unleſs it be that *Lancaſhire* is a more Hilly Country than *Eſſex*, which ſort of Lands, as they more need wet than Vales and low plain Countries do, ſo have greater ſhares of it than theſe have, beſides I leave it to you and others to judge, whether ſomething may not be attributed to the Weſtern Scituation of *Lancaſhire* near the Sea; from which Quarter the Winds in *England* blow more than from the Eaſtward.

At the foot of the Table of Rain, beſides the quantity which fell in each year, I have added the depth thereof in Inches; or what depth it would have been of, if the Earth had not imbib'd it, but it had ſtagnated on the ſurface thereof.

For the ſatisfaction of your ſelf and others that are curious, I have added two Tables more, of the Stations of the *Mercury* in the *Barometer* at *Towneley* in *Lancaſhire*, and at *Upminſter* in *Eſſex*, with the differences thereof; and this obſerv'd at 3 times of the day, *viz.* in the Morning, and about 3 in the Afternoon at *Towneley*, but at noon at *Upminſter*, and at 9 a Clock at Night. One Table to the firſt day of every Month; the other the moſt remarkably Low, High and more ſettl'd Stations of the ☿ the laſt year 1702.

By theſe *Barometrical* Tables it may be ſeen whether at all, or how far conſentaneous to truth, that opinion is of ſome learned curious Men both in *England* and abroad, *viz.* *That the ☿ aſcendeth and deſcendeth in all places at the ſame time, and in the ſame proportion.* It is manifeſt, that the ☿ doth commonly riſe and fall in one far diſtant place, when it doth ſo in another, but not alike: Alſo when any conſiderable variation is in one place it is ſo in another; when remarkably high, remarkably high; when low, low; when a great aſcent or deſcent, generally the ſame elſewhere; but only the differences of all theſe are not in equal proportion in all places; all which ſeemeth reaſonable to be expected, by reaſon of the difference of Weather in different places, eſpecially as to wet and dry.

There is one thing more in the following third Table, which I think deſerveth eſpecial remark, becauſe I believe it to be the moſt conſiderable alteration of the *Mercury*, that hath ever happen'd ſince the invention of the *Baroſcope*, and that was the deſcent on *Feb.* 3d and 4th laſt: Concerning which, Mr *Townely* in a former Letter gives me this account, “That on *Feb.* 3d the ☿ was at 3 in the Morning at 29. 15. at 3. h. 28. 50. and at 10 at Night at 27. 5. The next day it fell yet lower, and about 12 was at the loweſt, *viz.* 27. 39. but for an hour before and as much after, it varied only ſo much as to make it ſenſible that it was fallen and began to riſe again; the loweſt he had ever ſeen it before was on *Nov.* 18. 1674. when it fell to 27. 63. That Mr *Flamſteed* at the Obſervatory obſerv'd as remarkable a diſcent of his ☿; and that it happen'd about the ſame time of the day, *viz.* 2 of the Clock in the Afternoon at both places.

And laſtly he tells me, “That the deſcent in *Feb.* laſt was the greateſt that has been ſince the filling his Tube, which was in *March* 1665. The particulars which I obſerv'd here at *Upminſter* about that deſcent were, That on *Feb.* 2 the ☿ was high, *viz.* 29. 80, the next Morning 29. 50, at Noon 29. 16, at Night 28. 43, the next Morning (*viz. Feb.* 4.) at 7 of the Clock it was fallen to 28. 5, and was globoſe, as if it had riſen or was inclin'd to riſe; But it continu'd in the ſame ſtation till after Noon, and then began to riſe about 2 of the Clock, and roſe haſtily. The Weather accompanying was fair on *Feb.* 3d in the Morning, Hazy at Noon, and Rain at Night, and a violent Tempeſt in the Night, and all the next Morning, of *Feb.* 4th.

Thus, Sir, I have given you the trouble of a long Letter, but with no other deſign than to ſhew you my reſpects and gratitude. If you think any thing in it worth the cognizance of the *Royal Society*, you may communicate it if you pleaſe. However, I deſire you to do me the favour to ſhew it to Dr *Sloane*, becauſe I promiſed him what Mr *Townely* wrote, in which you will oblige me to add to the obligations of

Yours, &c.

TABLE I.

A Table, ſhewing how many Pounds, and Centeſimals of a Pound *Troy* of Rain, fell at *Townley* in *Lancaſhire*, and at *Upminſter* in *Eſſex*, in each month of the years 1699, *&c.* with the Quantity and Depth every year.

	1699.		1700.		1701		1702	
	Townl.	Upmr.	Townl.	Upmr.	Townl.	Upmr.	Townl.	Upmr.
January	17 91	8 91	20 84	3 91	22 41	14 96	21 10	9 81
Febru.	32 70	60 5	19 12	7 64	16 78	8 78	21 27	7 30
March	17 92	5 63	7 58	1 55	7 10	3 91	2 48	2 37
April	10 47	3 44	18 65	7 60	6 11	1 42	5 34	10 90
May	4 00	2 67	17 92	6 91	19 67	9 11	8 81	6 49
June	10 37	40	13 15	7 60	11 34	5 79	23 00	13 46
July	16 51	6 36	15 26	4 24	17 58	9 49	25 31	4 39
Auguſt	19 77	8 57	12 05	8 14	23 66	6 57	20 12	6 88
Septem.	16 53	8 06	23 52	14 85	21 30	5 63	23 01	8 05
October	18 90	13 49	26 44	17 15	24 59	10 21	28 57	7 92
Novem.	14 65	1 91	13 69	5 24	25 60	8 22	37 11	14 05
Decem.	16 78	5 77	26 88	10 30	10 19	9 35	41 63	10 27
Total	196 51	75 55	215 30	95 13	206 33	93 45	257 75	101 89
Depth	39 302	15 110	43 060	19 026	41 266	18 690	51 55	20 378

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TABLE II.

A Table ſhewing the Height of the ☿ at *Townley* and *Upminſter*, on the firſt Day of every Month in the Year 1702. three times a Day, *viz.* about 7 in the morning and 9 at night; and and about 3 afternoon at *Townley*, with the difference of the ☿'s Variation, and its difference between both places.

First Day of the Mon.	☿ Heig. at Town	☿ Heig. at Upmr.	Dayly differ. at Town	Dayly differ. at Upmr	☿ lower at Town
Jan.	29 06	29 28			22
	28 90	21	16	07	31
	58	10	32	11	52
Feb.	29 58	96			38
	40	91	18	05	51
	30	80	10	11	50
Mar.	36	68			32
	36	66	00	02	30
	40	58	04	08	18
April	70	79			09
	68	73	02	06	05
	69	79	01	06	10
May	20	51			31
		49		02	
	09	44	11	05	35
June	56	78			22
	61	82	05	04	21
July	84	98			14
	90	30 01	06	03	11
	92	11	02	01	19
Aug.	62	29 80			18
	49	74	13	06	25
	47	67	02	07	20

TABLE III.

A Table ſhewing the *Loweſt Stations* of the ☿ in the Year 1702. at *Townley* and *Upminſter*; with the differense of the ☿ at both places.

Day of the Month	☿ at Town	☿ at Upmr.	Diffe
Feb. 3	29 15	29 50	35
	28 50	16	66
	27 50	20 43	93
		05	
4	39	05	66
		62	
Dec. 23	77	18	31
	71	12	41
	90	10	– 35
		25	

High. Stations of ☿ An. 1702.

	Upmr.	Town	
Jan. 30	30 25	29 95	30
	25	95	30
	19	83	36
Mar. 12	33	30 02	31
	35	05	30
	32	07	25
Oct. 21	07	29 94	13
	18	99	19
	22	30 00	22

More ſettled Stat. An. 1702.

	Town	Upmr.	
Apr. 27	30 04	30 13	09
	00	15	15
	02	16	14
28	03	16	13
	01		
	29 99	15	16
29	98	15	17
	93	13	20
	86	06	20
May 13	78	29 89	11
	7[illegible]	87	15
	74	87	13
June 10	30	68	38
	40	71	31
	44	70	26

BRITISH MUSEUM NATURAL HISTORY.

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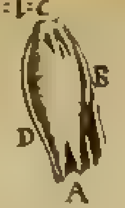

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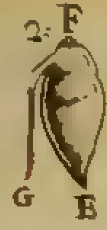

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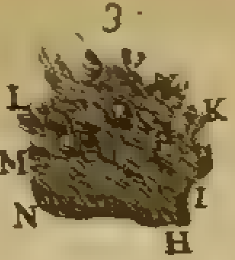

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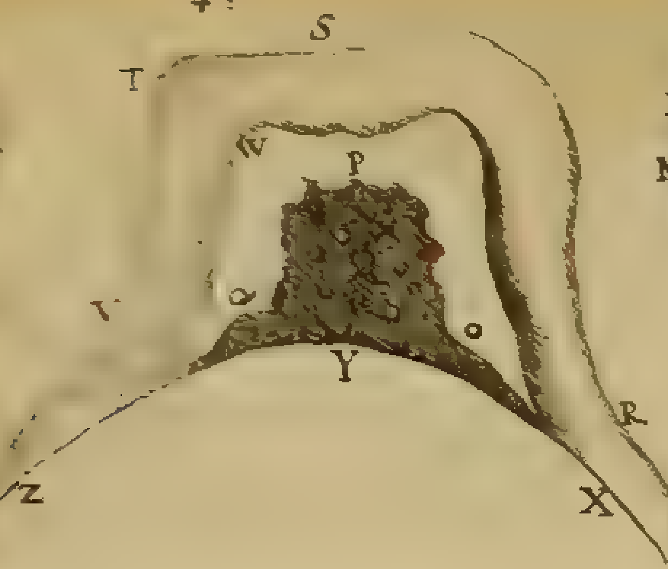

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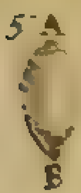

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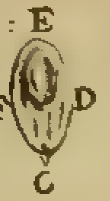

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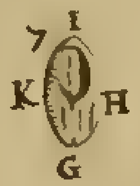

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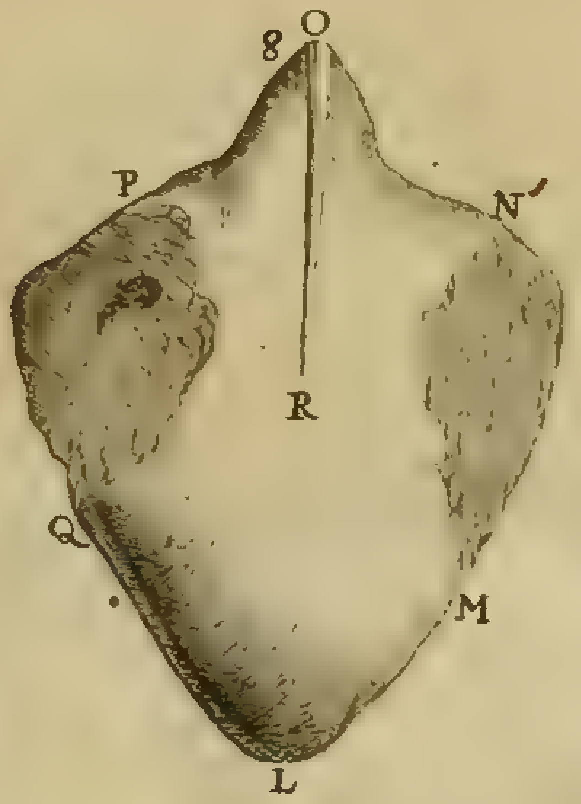

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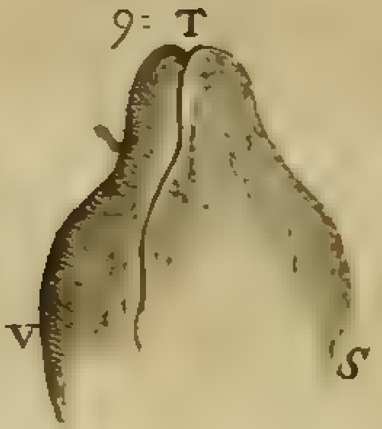

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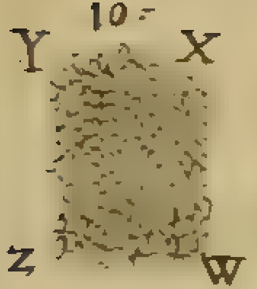

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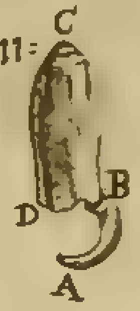

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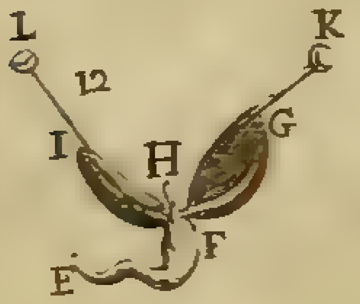

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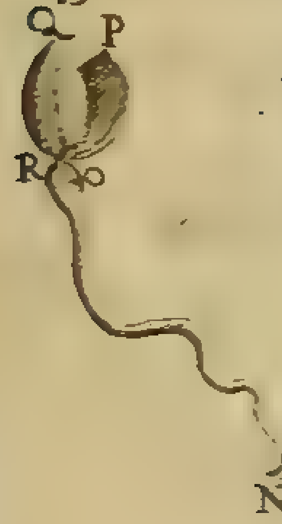

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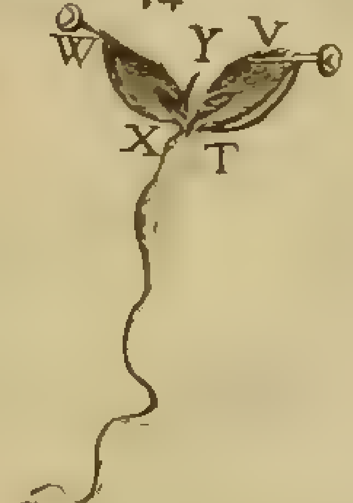

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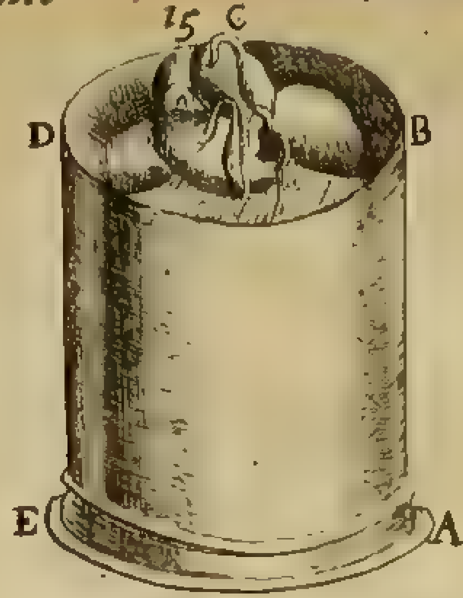

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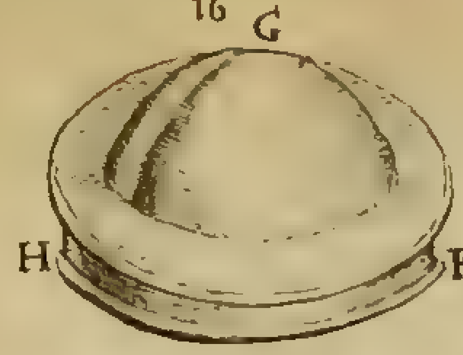

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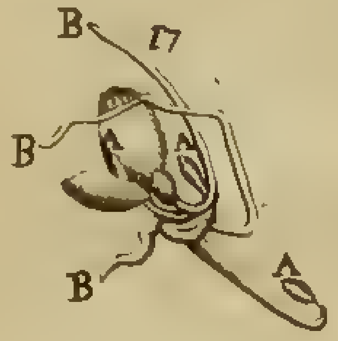

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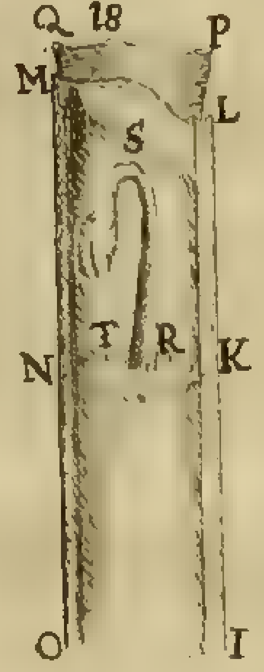

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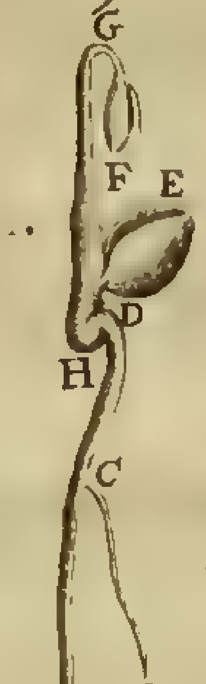

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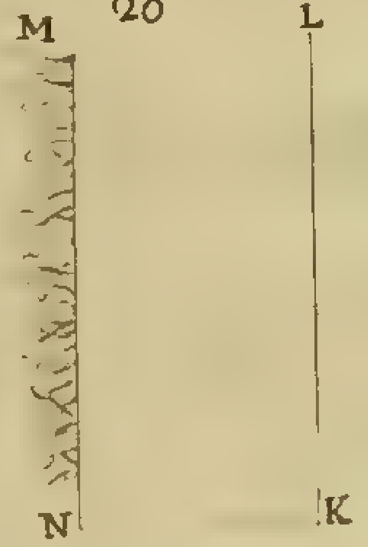

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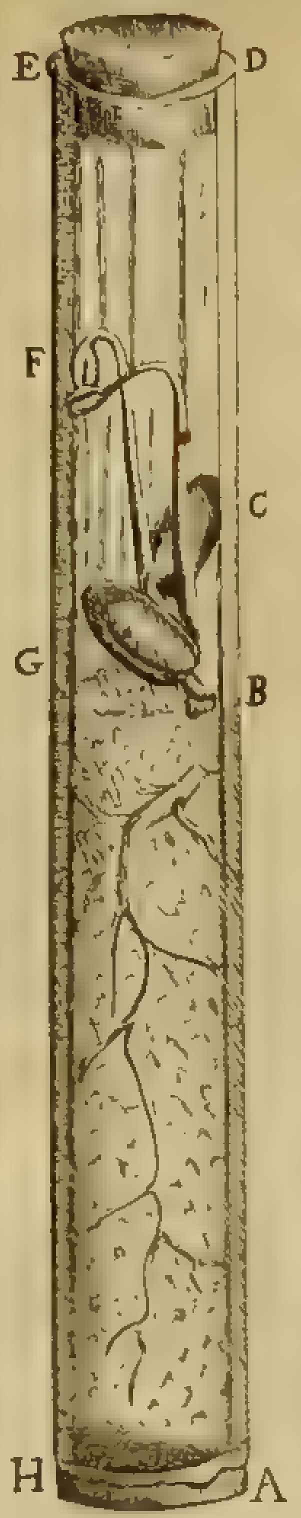

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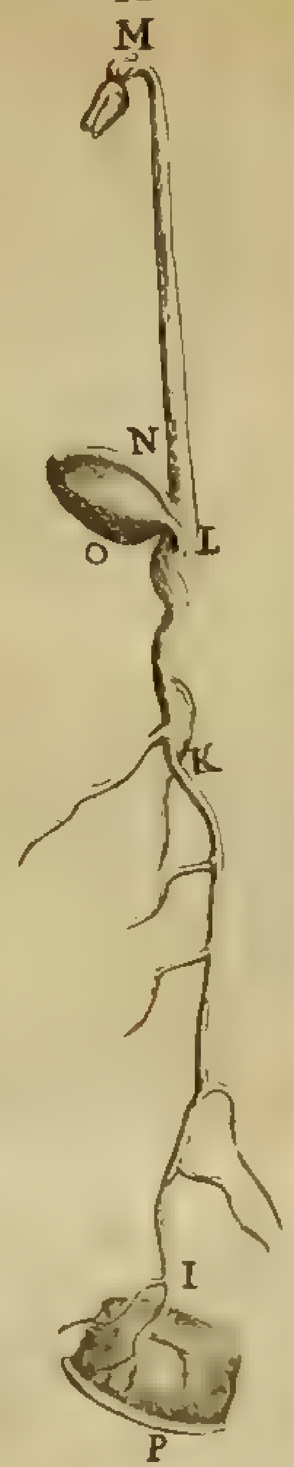

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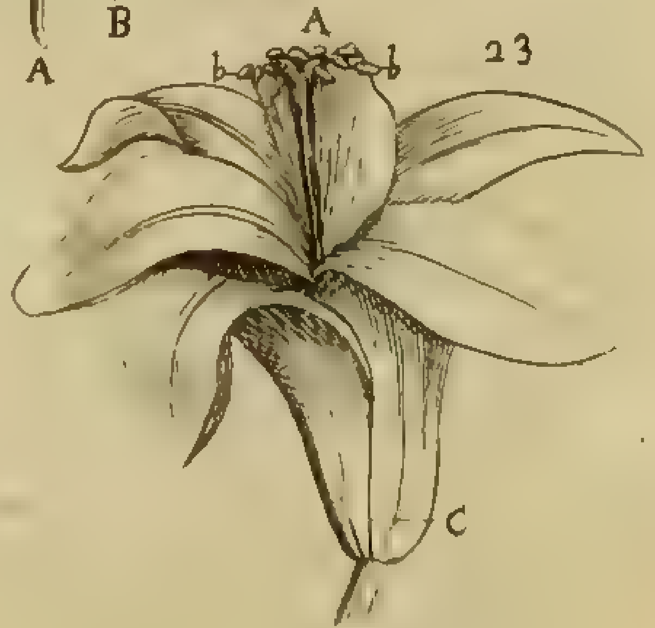

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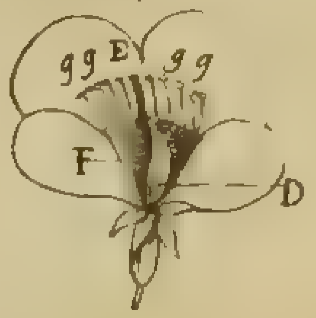

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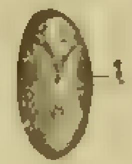

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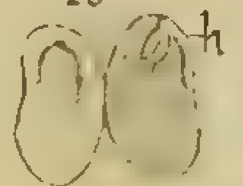

(Numb. 287)

PHILOSOPHICAL TRANSACTIONS.

For the Months of September *and* October, 1703.

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I. *The* Eighth *Book of* Eaſt-India *Plants, ſent from* Fort St. George, *to Mr* James Petiver, *Apothecary and* F. R. S. *with his remarks on them.*

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IV. *Experimentum Anatomicum ad veram Duræ Matris motus cauſam detegendam inſtitutum, ab* H. Ridley. *M. D. & Reg. Coll. Medic. Lond. Socio.* Sept. 20. 1703.

V. *An Account of a Book, entituled,* Conſilium Ætiologicum De Caſu quodam Epileptico: Quo reſpondetur Epiſtolæ Doctiſſ. Viri Thomæ Hobart, M.D. Annexa Diſquiſitione de Perſpirationis Inſenſibilis Materia, & Peragendæ ratione. Authore Gulielmo Cole, M.D. Coll. Med. Lond. Socio.

I. *The Eighth Book of Eaſt* INDIA *Plants, ſent from Fort St George* to *Mr James Petiver* Apothecary, *and* F. R. S. *with his* Remarks *on them.*

---

1. FUngus MADRASPATANUS, poroſi vulgaris facie.

This Muſhroom *is reddiſh above, ſprinkled with black oval Specks like Ink-blots, underneath it's whitiſh, and the pores very fine.*

2. Lichen *Madraſpat.* Algoides &c. *Gazophyl.* noſt. NAT. & ART. *Tab.* xi. Fig. 1.

3. Stratiotes quadrifolia Lujulæ facie *Gazoph.* NAT. Tab. 5. Fig. 12. *Where you may ſee its ſeveral Synomyms,* &c.

This may be an aquatick Fern, *the young ſhoots of the* Leaves *being hoary and ruſty like them; I have ſpecimens of it a ſpan and half long, it creeps and often takes root at every joynt, which are about an inch diſtant from one another, the* Roots *are fibrous and generally full of Sand, the* Leaves *from thence being of ſeveral growths and magnitudes.*

4. Aſarina *Malabarica* fol. ſerrato.

Aſarina minor *Zeylanica* Par. Bat. *prodr.* 315.

Cochlearia *Luzon.* ſylveſtris Camel. Not. Mſs. in Hort. Malab.

Hydrocotyle *Zeylanica* Aſari folio Inſtitut. Rei Herbar. 328. 2.

Ranunculo adfinis umbelliferis accedens, Chelidonij minoris folio *Zeylanica* minor *Pluk.* Tab. 106. Fig. 5. *Alm. Bot.* 314. pl. 9.

Valerianella *Zeylanica* paluſtris repens Hederæ terreſtri folio, ad radicem florida *Parad. Bat.* 238. Fig.

Codagen *Malab.* Ecapani *vel* Undiri *Bram.* Hort. Malab. *Vol.* x Tab. 46. p. 91. Taquebcohol *Luzonenſibus.*

This differs from our Cotyledon aquatica, *Marſh Pennywort, or white Root, in having ſerrated Leaves, and thoſe not umbilicated.*

5. Lycopodium *Malabaric.* folijs criſpis.

Muſcus fruticeſcens caulibus & ramulis folioſis capillaribus undique cinctis *Ray* Hiſt. Plant. *Vol.* 3. lib. 2. p. 31. 2.

Muſcus ſquamoſus ſ. Lycopodium *Americanum* altiſſimum *Plumier. Inſt.* R. H. 554. 10.

Muſcus *Zeylan.* terreſtris clavatus erectus. *Badal wanaſſa* Zeyl. *Herman.* Hiſt. *pl. Oxon.* p. 624. 6. Tab. 5. *Sect.* 15. Ser. 1. pl. 3 *Ray.* H. Pl. v. 3. p. 33.

Bellan Patsja *H. Mal.* V. 12. p. 73. Tab. 39. pro 40 *per Errorem* Moni aw *Herb.* noſt. *Chin.* pict. Tab. 3. Fig. 2.

I have received this from Fort St George *and* China. *Monſieur Vaillant* Secretary to *Dr Fagon*, the French King's chief Phyſician, hath alſo ſent it me collected by that Curious and Acurate Botaniſt *Pere Plumier.*

6. Phyllitis ramoſa, *Madraſpat.* margine ſeminifera, venis reticulatis. 6

Theſe pinnæ or Leaves ſtand on ſhort footſtalks, generally oppoſite and terminate ſingle, each Leaf in ſhape reſembles Hartstongue, *but is leſs, and very thin and limber, its Veins knit one into another, the edges are liſted with Seed.*

7. Phyllitis ramoſa *Madraſpat.* Salicis folio venis parallelis. 7

The pinnæ reſemble the Leaves of Willow, *are very ſharp pointed, ſtiff, and notched with prickles, I have not yet obſerv'd its Seed, but believe it to be along the edges.*

8. Phyllitis ramoſa *Malabarica* marginibus albis. 8

Filix repens ſcandenſve, folijs longis integris, ſerratis, nervoſis alternatim ſcapo adnaſcentibus *Ray* Vol 3. l. 3. p. 76.

Phyllitis *Luzon.* ſcandens Camel. Not. *in* H. Malab.

Panna Valli *H. Mal.* V. 12. Tab. 35. p. 69. Panay pay *Luzon.*

This differs from the laſt in having thinner Leaves, *with notches finer and thicker ſet, and what is moſt peculiar to them is they are white, on this part I ſuppoſe is to lye the Seed, becauſe I generally obſerve the Notch-Leaved Ferns to be* margine pulverulento.

9 9. Lonchitis *Madraſpat.* Polypodij facie.

an Filix minor Polypodij folijs ſurculoſis, pinnis oblongis per margines crenatis *Ray* V. 3. l. 3. p. 58 ?

The Wings ſtand alternately, and are above 1 *Inch long, and* $\frac{3}{8}$ *broad, finely ſerrated, and only upper ear'd, i. e. a ſingle auricle on the upper part of each Leaf, like that in Dr* Plukenet'*s Phytographia* Tab. 30. Fig. 4. *but not ſo large.*

I have not yet ſeen its Seed.

10 10. Lonchitis *Madraſpat.* longifolius, marginibus maculatis.

Theſe pinnæ ſtand cloſe together, and very near oppoſite, near 3 *Inches long, and* $\frac{1}{3}$ *Inch broad, they are ſharp, notcht towards the point, the reſt lightly waved, each Wing at ſetting on, hath a little upper ear.*

11 11. Filix *Madraſpat.* pyramidalis circa nervum maculata. *an* Filix non ramoſa Indica pinnulis obtuſis non crenatis *Ray* Vol. 3. L. 3. p. 80 ? *an* Kari welli panna maravara *Mal.* Maa Panaa *Bram.* Groote wild Panna *Belg.* H. Mal. V. 12. Tab. 17. p. 35. *This is not Dr* Plukenet'*s Tab.* 179. *Fig.* 2. *as he queries in his* Alm. Bot. 151. pl. 9.

The Leaves *of this are not eared like the laſt, each ends long pointed, and the Steeple or upper pinnæ reſemble our* common Lonchitis.

12 12. Filix pyramidalis *Madraſpat.* pinnis longiſſimo mucrone terminantibus, marginibus ſeminiferis.

Lonchitis *Indiæ Orientalis* pinnis crebris prælongis anguſtis ſerratis in longiſſimos & tenuiſſimos mucrones productis *Ray* V. 3. p. 68. 13.

This is diſtinguiſht from all others by its very long tips, ſelvidged with Seed in ſtreaks

13. Filix ſcandens *Malab.* pinnis integris alternatim ſitis. 13

Filix ſcandens *Indica*, ramulis ex adverſo binis, folijs alternatim ſitis, oblongis, anguſtis cuſpidatis *Ray* V. 3. l. 3. p. 90.

The top Leaf is often fork'd, the reſt ſingle. I have received it not only from Fort St George, *but alſo from the* Grain *and* Gold *Coaſts of* Guiney.

14. The *Male* Bangue. 14

Bange *Clus.* Exot 238. c. 25. & 290. c. 54. *Fragos.* 58. c. 26.

Bangue arbor Cannabi ſimilis ad omnia fere utilis ſeu *Amſion* (s. Opium) *Linſchot* Ind. Or. pt. 4. c. 35.

Bangue Cannabi ſimile I. B. Vol. 3. l. 30. p. 449. c. 71.

Cannabi ſimilis exotica C. B. 320. 4. C. B. phyt. 640. 3.

Cannabis minor *Bangue* Indorum *Par. Bat.* Cat. Pl. *nond.* Fig.

Cannabis minor & lignoſior *Bangue* dict. Ray. V. 3. p. 104.

Cannabis peregrina, gemmis Fructuum longioribus, *Bangue* dicta H. Ox. Sect. XI. p. 433. 2.

Kalengi Canſiava *Malab.* Bangi *Bram* : H Mal. V. 10. Tab. 60. p. 119. Maglimba s. Bangue *Caffrorum*, Axis *Arabibus*, Aſarath *Turcis*, Bangue *Perſis*, Decanenſibus, *&c.*

This very much reſembles our Common Hemp.

The Hort. Malab. *ſays this ſort is much ſtronger than the next.*

15. The *Female* Bangue. 15

Bangue *Malabar.* trifoliata.

Bangue *Durant.* 62. Fig. Lugd. 1914. c. 142. Fig. *Park.* 1624. c. 82. Fig. *The* Icons *of theſe 3 Authors expreſs the* Leaves *for the moſt part trifid, ſome few towards the top ſingle.*

Cannabis *Indica* trifoliata s. *Bangue* Indorum *Alm. Bot.* 80. pl. 6 lin. 16.

Tsjeru Cansjava *Mal.* Tsjada Bangi *Bram.* H. Mal. V. 10. Tab. 61. p. 121.

This is diſtinguiſht from the laſt in having generally but three Leaves.

16 16. Urticæ majoris facie Planta *Madraſpatana.*

The Leaves, *which are all at preſent I have yet ſeen, very much reſemble the* Ana Schorigenam *H. Mal.* V. 2. T. 41. p. 77.

17 17. Mercurialis *Madraſpat.* acetabulis & folijs majoribus, ſerratis.

an Cupameni H. Mal. V. 10. Tab. 81. p. 161.

This is much larger in all its parts than the next, and its acetabulæ or leavy involucrums more ſerrated.

Mr Charles du Bois *was pleaſed to favour me with a ſpecimen of this* A. D. 1698. *gathered at* Fort St David, *by* Mr Alex. Brown, *Surgeon.*

18 18. Mercurialis *Madraſpat.* acetabulata, fol. rotundo minore. *an* Mercurialis *Zeylanica* tricocos cum acetabulis *Kupamenija* Zeylan. H. *Leyd.* app. 687. Fig?

This differs from the laſt in being much leſſer, and having rounder and ſmaller Leaves, ſlightly notched, which agrees with Dr Herman's *Figure.*

19 19. Mercurialis *Madraſpat.* fol. acutiore, caule piloſo. *an* Welia Cupameni *H. Mal.* V. 10. Tab. 83. p. 165.

The Leaves *of this are more pointed than the laſt, and the Stalks only (not the pedicles of the Leaves) are hoary, as the others are ſmooth: Theſe ſpikes when they have loſt their Seed, ſhew a ſmall leafy involucrum, which till then is not perceived.*

20 20. Lappula *Malabarica* major.

Xanthium *Malab.* capitulis lanuginoſis *Muſ. Petiver.* 99. Act. Phil. No.

21. Lappula *Madraſpat.* minor.

21 *an* Pupal Valli H. *Mal.* V. 7. Tab. 43. p. 81?

This differs from the laſt in being leſs, its Leaves *more pointed and ſmooth like* Marvel *of* Peru.

The following are Ricini, *with whole or but ſerrated Leaves.*

22.

22. Ricinus *Madraſpatanus* Heliotropij triccoci facie. 22

This ſeems to differ very little from the common Turnſole, *which grows frequently about* Mompelier. *The Seed is cover'd with a whitiſh skin, except on two ſides it appears black as if rubb'd off.*

23. Ricinus *Madraſpatanus* Mercurialis facie. 23

24. Ricinus *Malabaricus* ſpinoſus Phyllitidis folio. 24

Cynogloſſum arboreſcens *Luzon.* Camel *Not.* in Mſs. H. Mal.

Euphorbio & Tithymal. media affinis aizoides *Indic.* arboreſc. ſpinoſa, Nerij folio *Breyn.* Pr. 2. p. 45. pl. 3.

Tithymalus *Indicus* arboreſcens ſpinoſus Nerij folio Hort. Amſt. Fol. 25. Tab. 13.

Tithymalus arboreſcens ſpinoſus *Zeylanicus* fol. Laurinis Par. *Bat.* Cat. Pl. *nond.* Fig. 13. *Zeylanicus* ſpinoſus arboreſcens P. *Bat.* pr. &. append. *Pluk.* Tab. 230. Fig. 4.

Ela calli *Malab.* Nivuli H. *Bram.* Mal. V. 2. Tab. 43. p. 83. Talinaſco Baet & Sorog Sorog *Luzon.* Ray H. Pl. 1888. H. *Ox.* S. 10 p. 344. 2.

I have both received this from the Eaſt Indies, *and ſeen it growing at* Hampton Court.

25. Ricinus *Madraſpat.* pediculis apiculatis folijs Aurantij.
an Pee Tſierou Ponnagam *H. Mal.* V. 5. Tab 23. p. 45? 25

Theſe Leaves *have the ſhape and texture of thoſe of* Oranges, *are lightly ſerrated but not perforated; what I have obſerv'd peculiar in this and ſome other of the* Ricini lacciferi *is, to have on each ſide of the Pedicle or baſe of the Leaf, a ſmall excreſcence like the Stamen of a Flower, with its apex on it.*

26 Ricinus *Madraſpat.* marginibus foliorum quaſi apiculis 26
donatis, Quercus floribus.

an Ponnagam *H. Mal.* V. 5. Tab. 21. p. 41?

Theſe Leaves *which are broader than the laſt, have not the apiculæ at the baſe, but ſomething like it on the edges of the Leaves.*

27. Ricinus *Madraſpat.* Reſinifera, Lauroceraſi folio. 27

The Leaves *ſtand on very ſhort footſtalks, are thick as the,* Laurel, *and ſome of them as large and more veiny; from the boſom of theſe come cluſters of Flower-buds like thoſe in* Holly, *at the tops of the branches I often obſerv'd drops of* Gum, *reſembling* Maſtick.

28 28. Ricinus *Arcautenſis* Chamænerij folio.

Arcaut *is about* 25 *Leagues from* Fort St George.

Its Flowers and Fruit grow at the top of the branches, the Leaves *exactly reſemble the* Willow-bay, *grow alternately, and on each ſide at their ſetting on grows a fine hair or beard.*

29 29. Ricinus *Malabar.* Linariæ folio vix ſerrato.

Ricinus *Indicus* minor, fol. Saligineis ſerratis *H. Ox.* S. 10. p 349. pl. 23.

Ricinus *Malab.* fruteſcens Lathyridis facie fructu in foliorum alis echinato *Alm. Bot.* 321. pl 2. lin. 8.

Lathyris fruticeſcens fructu in foliorum alis echinato *Ray.* H. Pl. 1710. c. 10.

Codi Avanacu *Mal.* Boin Erando *Bram.* H. Mal. V. 2. T. 34. p. 68.

Parang tantan tantan *Luzon.*

We come next to the Ricini *with divided Leaves, which are called* Palma Chriſti.

30 30. *Barbadoes* Phyſick *Nut.*

Ricinus *Americus* Lugd. 1790. c. 25. *Fig.* Fructus.

Ricinus *Americanus* Aldin. 86 *Ger.* 399. Fig. 2. Fruct. *Ger.* emac. 496. *Lob.* Ic. 688. *Park.* 183. Fig. 4.

Ricinus *Americanus* major ſem. nigro *C. B.* 432. 3.

Ricinus *Americ.* Curcas *vocatus* Clus. *Exot.* 299. c. 4. Fig. *Fr.*

Ricinus maj. *Americ.* Curcas *dictus* & Faba purgatrix *Indiæ Occiduæ* I. B. V. 3. l. 34. p. 643. Fig *Chabr.* 529. Ic. 4.

Ricinus Ficus folio, flore pentapetalo viridi, fructu lævi pendulo *Cat. Pl.* Jam. 40. 1. *Ray* H. Pl. 166. 2. *H. Ox.* S. 10. p. 348. 15.

A particular account of this Plant, with the uſe of its Kernels we may expect ſuddenly to ſee in Dr Sloan's *Hiſtory of* Jamaica, *which is now in the Preſs.*

31. Ricinus *Madraſpat.* trifidus, dentibus apiculatis. 31
Ricinus *Madraſpat.* fl. purp. trilobato folio, mitibus denticellis crenato *Pluk.* Tab. 220. Fig. *Alm. Bot.* 320. pl. 5. *H. Ox.* S. 10. p. 348. No. 8. *Ray* V. 3. l. 4. p. 113. pl. 6.
The notches of the Leaves *are very particular in being apiculated, which is not to be ſeen in the* Weſt India *kinds.*

32. Ricinus *Madraſpat.* folio trifido lævi.
The Leaves *of this are deeper cut and much ſmoother than the next.* 32

33. Ricinus *Madraſpat.* fere trifidus, aſper.
Ricinus aſperior Alceæ Venetæ folijs aliquatenus accedens *Maderaſpatana* Pluk. *Tab.* 220. Fig. 2. *Alm. Bot.* 320. pl. 9. H. *Ox.* S. 10. p. 348. 14. *Ray* Vol. 3. l. 4. p. 113. 5. 33
The whole Plant is thick ſet with ſtiff white hair, the Leaves are generally lobated, but ſometimes whole, or but one ſide eared.

34. Ricinus *Madraſpat.* alte trifidus, aſper. 34
Ricinus urens Cannabinis folijs tryphyllos e *Madraſpatan.* Pluk. Tab. 120. Fig. 6. *Alm. Bot.* 320. pl. 6. H *Ox.* S. 10. p. 348. 13. *Ray* V. 3. p. 113. 4.
This is as hairy as the laſt, and more deeply cut than in No 32.

To theſe the Tithymals *and* Dwarf Spurges *may be fitly joyn'd, as alſo a Plant which the* Malabars *call* Nirouri, *and it ſeeming it be a ſpecies between the* Ricini *and* Tithymali, *I chuſe to place them here,* viz.

35. Nirouri *Malabarica* fructu & calyce maximo.
Frutex baccifer *Malabar.* oſſiculo fragili cum 6 intus nucleis *Ray* H. Pl. 1558. c. 30. 1. Perin Nirouri s. Ma Nirouri & Ma pana poſa *Mal.* Poja *Bram.* Fruita da Trinidado *Luſit.* Maagdelynen *Belg.* Hort. Mal. V. 5. Fig. 43. p. 85. *Fl. Mal.* 120. 5. *id.* Fol. 30. col. 2. pl. 13. 35
The largeneſs of its Fruit and Calyx diſtinguiſh it from the following.

36. Nirouri *Malabar* floribus binis terniſve.

36

Katou Nirouri *Mal.* Bane poje *Bram :* Folhas de dentes *Luſit.* wild Maagdelyn *Belg.* H. Mal. Vol 5. Tab. 44. p. 87. *Ray.* H. Pl. 1636. 2.

What diſtinguiſhes this from the next is its having more than one Flower, *from the boſom of its Leaves, and the leſſer Branches come two or three together, which the* H. Mal. *very well expreſſes.*

37 37. Nirouri *Madraſpat.* niger, fructu pyramidali.

an Nirouri *H Mal.* V. 2 Tab. 27. p. 45. *an* Frutex *Indicus* baccifer Vitis Ideæ 2dæ *Cluſij* folijs *Breyn.* Cent. p. 8. [c. 4 Fig ?

an Vitis Idea *Maderaſpatenſis* Niruri *forte* Malabarenſibus *dicta* Pluk. *Tab.* 69. Fig. 3 ? & *an* Vitis Idea *Bengalenſis* Uva Urſi bacca ſingulari ad foliorum exortum barbulis donata *Pluk.* Tab. 69. Fig. 4.

Theſe two ſeeming both the ſame, but in different ſtate.

The Flower *and* Fruit *of this comes ſingle between* 2 *ſmall hairy Beards ; the Stalks and Leaves turn blackiſh in the dry Specimens.*

38 38. Nirouri *Madraſpat.* Senæ folio longiore.

The Flowers *and* Fruit *are like the laſt, but ſmaller, and by its Leaves it's eaſily diſtinguiſht.*

39 39. Nirouri *Madraſpat* Hyſſopi folio longiore.

What is peculiar to this and the next is, in having their Stalks flattiſh, and as it were welted.

40 40. Nirouri *Madraſpat.* Hyſſopi folio breviore.

an Frutex baccifer folijs Lini *vel* Caſſiæ Poeticæ *Maderaſpatenſis* noſter *Ray* H. Pl. *Pluk.* Tab. 31. Fig. 2. & Fruticulus, *capſularis* hexapetalos Caſſiæ Poetarum folijs e *Madraſpat.* Pluk. Tab. 183. Fig. 4. *Theſe two ſeem mainly to differ, this in the ſhortneſs, the laſt in the length of its* Leaves.

41 41. Nirouri *Madraſpat.* Mimoſæ foliis.

an Tſieru Kirganeli *H. Mal.* V. 10. Tab. 16. p. 31?

The Berry is perfectly tricoccos and furrowed like the Spurges, *its* Leaves *and manner of growing diſtinguiſh it from all the aforegoing.*

42 42. Nirouri affinis *Madraſpat.* Portulacæ minoris folio.

The Fruit *of this is brown, ſmooth and conical, about the bigneſs of a* Cherry-ſtone, *it breaks from the bottom into* 5 *or* 6 *parts, containing near as many white longiſh triangular Seed.*

43. Chamæ ſyce *Madraſpat.* major lævis.

an Tithymalus Botryoides *Madraſpat.* Hyperici folijs non 43
crenatis floribus ex alis uno verſu prodeuntibus *Pluk.* Tab. 43. Fig. 7.

I do not find this diſpoſition holds of Flowering only on one ſide, as Dr Plukenet *aſſerts, having many ſpecimens to the contrary; Theſe* Leaves *are very ſmooth and without notches.*

44. Chamæſyce major hirſuta, *Indiæ utriuſque* Muſ. Petiv. 758. 44

This differs from the laſt in having hairy Stalks, *and the* Leaves *lightly ſerrated, the cluſter of* Seed *are alſo cloſer ſet.*

45. Chamæſyce *Madraſpatan.* maculata major. 45

Theſe Leaves *grow by pairs without ſmaller ones amongſt them, they very much reſemble our* Sanct foin.

46. Chamæſyce *Madraſpat.* maculata minor.

an Tithymalus s. Chamæſyce altera *Virginiana* folijs cre- 46
natis & macula fuſca elegantur notatis *Ray.* H. pl. *Pluk.* Tab. 65. Fig. 8. & *Alm. Bot.* *H. Ox.* S. 10. p. 341. 21.

Theſe Leaves *are much ſmaller than the laſt, and ſomewhat notcht.*

47. Chamæſyce *Madraſpat.* foliis majoribus.

Theſe Leaves end broad, and are narrow at baſe, have rarely 47
any boſom Leaves, the Seed *comes generally at the end of the branches.*

48. Chamæſyce *Madraſpat.* folijs minoribus. 48

This is void of ſpots, otherwiſe very like No 46, *it's thick ſet with ſmall* Leaves, *and the Seed comes from its boſoms.*

49. Acetoſa *Madraſpat.* veſicaria Betæ folio.

Acetoſa Africana *Broſs* Hort. *Paris.* and *Hort.* Groning. 49
Viridar. var. 84. & 596.

Acetoſa *Africana* Robini *veſicaria* virid. var. 476. *Hort.* Lugd. Bat.

Acetoſa *Americana* annua folio carnoſo *virid.* var. 2. *Hort.* Hafn.

Acetoſa *Americana* ſolijs longiſſimis pediculis donata C. B. 114. 6. *prodr.* 54. c. 18. 1.

an Acetoſa *Indica* Park. 744. 10?

an Acetoſa *Indica* folio carnoſo *Virid.* var. 398. *Hort.* Patavin.

Acetoſa veſicaria *Americana* Park. 744. 11. veſicaria peregrina *H. Eyſt.* veſicar. *utriuſque Indiæ* annua *Alm.* Bot. 8. pl. 3.

Oxalis *Africana* I. B. Vol. 2. lib. 23. p. 992. Fig. *prodr.* 69. pl. 19.

Oxalis *Africana* elegantiſſima, floſculis ex luteolo virentibus *Chabr.* 312. Fig. 2.

Ray H. Plant. 179. Hiſt *Oxon.* 583. Sect. 5. pl. 7. Tab. 28. Ser. 2. Fig. 7.

John Bauhine's *Figure and Deſcription exactly reſembles this Plant, and he doubts whether it be not the* Oxalis Zacynthi Inſulæ *Proſp.* Alpini *de* Plant *Ægypt.* cap. 43. *which the* Apothecaries *of that Iſland uſed in their Medicines; but I cannot believe it, becauſe* Alpinus *ſays his was a very little Plant, with ſmall thick longiſh Leaves, reſembling* Marygolds, *this being no ſmall Plant, and has large Leaves very like the* white Beet.

50 50. Triopteris *Malabarica* Epimedij folio.

Acetoſa *Luzon.* Saxatilis nigritarum *Camel.* not. Mſs in Hort. Malab.

Solano affinis *Malabarica* flore & baccis rubeſcentibus *Camel.* in *Hort.* Malab. Vol. 9. Tab. 86. p. 168.

Tſieria Narinam pulli *Malab.* Ambetti *Bram.* H. Mal. V. 9. Tab. 86. p. 167. Lingat vel Salalay *Luzon.*

This agrees very well in moſt particulars with the Hortus Malab. *and it ſeems to be an herbaceous* Triopteris.

51 51 Triopteris *Malabaric.* ſcandens Inhame folio.

an Katu Katſijl *Hort.* Malab. V. 7. Tab. 36. p. 69?

This may be a ſort of Inhame *vulgo* Yam *or* Potatoe, *and is diſtinguiſht from others, in having a large three winged Seed Veſſel.*

II. *A Letter from Mr* Anthony van Leuwenhoek, *concerning the Seeds of Oranges*, &c.

Delft in *Holland*, the 6th of *Feb.* 1703.

I Have formerly, according to my ſmall capacity, abundantly demonſtrated, that almoſt all Seeds are only made for the nouriſhment of the young Plant within them (which is a ſmall Particle of the Seed, as little as it appears to our Eyes) till it be able to ſpring forth from the Earth; but foraſmuch as I lately met with the Seed or Kernel of an Orange, in the middle of which, to my great ſurprize, I found another compleat Seed; I have taken the liberty to ſend to you my Obſervations about the ſaid Kernel, and the growth of it.

I have ſeveral times open'd the Kernels of Oranges and Limons, and often found that what we call a Stone, Kernel or Seed, is improperly ſo call'd, and that when we have ſtript it of Skin or Membrane, we ſhall frequently find that two Seeds are inclos'd in that Membrane, to wit, under the Skin, and without ſide of the Kernel there is a ſmall Seed, the like of which has not occurr'd to me in other ſorts of Seeds.

'Tis true, you ſhall often find in Hazel-nuts, Almonds, Peach and Apircock Kernels, a double Seed or Kernel, but then each of them is inclos'd in a double Membrane, that have no communication with one another but in a bare ſimple contact, but have each of them a diſtinct Stalk or String, by which conſequently they receive their proper nouriſhment.

In the Month of *November* laſt, two Gentlemen made me a Preſent of *Surinam* Oranges, and in the firſt I open'd I found eight and thirty compleat Kernels, but in neither of two others could I meet with four good Seeds; I open'd ſeveral Kernels of the firſt Orange, one of which, ſurrounded with its Membrane, I caus'd to be drawn, as you will ſee in Fig. 1. A B C D.

When I had ſtript one of theſe Kernels of the outmoſt Membrane, I diſcover'd that there lay a String under it, that caus'd a little protuberance in the firſt Skin, repreſented in the ſaid Figure by A B C, from which String, not only the Seed, but the Plant within it receives its increaſe and nouriſhment. Fig. 2. E F ſhews you the ſame Seed ſeparated from its firſt and hard Skin, which is only given to it, as I conceive for the defence of the inward parts; whereas Nuts, Almonds, Peach ſtones, *&c.* are arm'd with ſtrong and thick Shells, F G repreſents the aforeſaid String, which I parted a little from the Seed itſelf, that I might render it the more viſible, and which String is not only joyn'd to the Seed at F, but extends its ſmall Veſſels alſo thro the ſecond Membrane from F towards E, the ſeat of the Plant, and in order to its nouriſhment, but thoſe Veſſels are ſo exceeding fine and ſmall, that they eſcape the ſight before you trace them to their journeys end.

Now we may certainly conclude that the ſaid String does actually comprehend in its ſelf as many diſtinct Veſſels, as are to be found in the Orange-Tree when it is arriv'd to full maturity; for if all theſe Veſſels were not in the young Plant whilſt it lies involv'd in its Mother; the Kernels Womb, whence can they proceed afterwards? but this is ſo ſelf-evident, and will be ſo eaſily granted me, that I need not ſay more on that topic.

Tho the ſaid String was very ſmall, yet I was reſolv'd to try if I could give you a ſight of the Veſſels within it, and I ſucceeded ſeveral times, but not without a great deal o trouble to me before I could place it in ſuch a poſition, as my Limner might be able to draw it exactly.

Fig. 3. H I K L M N repreſents a part of the ſame String cut-acroſs, which Fig. 2. F G gives you entire, and in its whole length.

The ſaid Particle of the String at H I M N has abundance of exceeding ſmall Veſſels, but very hard to be ſeen, about I K L M they grow larger, and conſequently more viſible; and thus you may ſee a great many, tho not all of the Veſſels.

After I had made this obſervation, I was thinking whether theſe great Veſſels were not the origin or ſource of the contexture of that Membrane which covers the Seed; and on the other ſide, whether the former deſcrib'd by H I M N were not the feeders of the Seed and Plant.

I had alſo plac'd a piece of another ſtring of the Kernel of an Orange before another Microſcope, of which I have given you a rough draught, only to ſhow how the utmoſt Membrane incompaſſes the String in order, as I ſuppoſe, for its ſtrength and defence.

Fig. 4. O P Q repreſents the ſaid String cut acroſs, R S T V that part of the hard Membrane that ſurrounds it, T V Q W are faintly ſhewn that infinite number of Fibres, particularly at Q W, that Nature uſes in the contexture of ſuch a ſmall String.

The laſt Phenomenon ſuggeſted to my thughts, that thoſe long Fibres repreſented by Q W were deſign'd to add a ſtiffneſs and ſolidity to the outward Membrane, for the better defence of the internal Veſſels.

I have often obſerv'd that the outmoſt Membrane RSTV did compreſs the String ſo cloſely, that there remain'd little ſpace between them.

In the ſaid Fig. 4. X Y Z is repreſented that Membrane, which ſurrounds the Kernel or Seed and the Plant; the ſaid Membranes are very thin, and particularly the inmoſt of them.

Such a Seed or Kernel being cut acroſs, you would think the Particles of which it is compos'd, to be nothing but irregular Globules ſqueez'd or compreſs'd cloſe together.

Fig. 5. A B repreſents ſuch a Seed diveſted of its Membranes, and which ſeem'd to have but one Plant within it, whereas I have often ſeen under the Membranes another ſmall Plant, which lay as if it were ſqueez'd into the ſubſtance of the Seed, and ſo is not to be ſeen till the Seed be ſtript of its Membranes, contrary to thoſe of Nuts, Peaches, Almonds, *&c.* which where there is two of them, lye entire and diſtinct in their proper Membranes, as I have hinted to you before.

I have likewiſe obſerved under the Membrane or Skin of an Orange-kernel three diſtinct Seeds with their Plants, but ſome of them indeed much bigger than the others.

Theſe Seeds with their incloſed Plants are eaſily divided into two Lobes or diſtinct parts, inſomuch that they do not ſeem to have been united but only where the ſmall Plant lies; ſo that the whole Kernel, Fig 5. A B, was fram'd by Nature for no other uſe, in my opinion, but to foſter and nouriſh the tender Plant within, till it be able to ſtand alone, and draw its ſubſiſtance from the Earth about it.

Having ſplit the Seed, Fig. 5. A B, into two parts, one half of which is repreſented by Fig. 6. C D E F, together with part of the Plant, that would have been a Tree ſticking cloſe to it, you may ſee the Plant it ſelf at C, no bigger than a grain of Sand to the naked Eye.

That which induced me to give you ſo exact an account of the Anatomy of an Orange kernel, was, becauſe I diſcovered (to my great wonder) another Seed or Kernel, together with its Plant, in the heart of the former.

The counterpart of the aforeſaid Kernel is deſigned by Fig. 7. G H I K, and G the little pit or bed of the Plant, and in the ſaid Figure between H and K, the concavity wherein the ſecond Seed alſo lay, *vid.* D F in Fig. 6.

This Phenomenon was wholly new to me, tho I had diſſected many ſorts of Seeds before, *viz.* to ſee in the middle of one Seed or Kernel another compleat and perfect Seed; eſpecially when I conſider'd that from the Veſſels ariſing out of the String, and diſperſing themſelves through the Membranes, both the Kernel and Plant are produced; and yet theſe ſame Veſſels muſt inſinuate themſelves into the very heart of the firſt Seed before they can produce a ſecond Seed and Plant within it; when I conſidered all this, I ſay I was ſtruck with admiration, and could not forbear crying out, Oh the inſcrutable Wiſdom of God, *&c.*

I thought it would not be amiſs to place ſuch a ſmall Plant as is repreſented by C in Fig. 6. before a Microſcope, and cauſe it to be delineated, as you may ſee in Fig. 8. L M N O P Q, whereof Q L M is partly that which Nature intends for the body and root of the Tree, N O P the Leaves wherewith the young Plant is already provided, and O P repreſents that part of the Leaf which is next the ſight, and ſomething protuberant, by reaſon of the incloſ'd ſmaller Leaves.

In the ſaid Fig. 8. by M N and P Q are ſhewn the two ſides of the Plant torn off from the Kernel, to which it was united, and from which it did receive its nouriſhment

Moreover, I took the ſaid young Plant as it ſtood before the Microſcope, and turn'd it a little about, in order to ſhew the two largeſt Leaves, whereas in the former poſition I could ſee but one of them.

Fig. 9. S T V repreſents the two great Leaves in this poſture, between thoſe ſaid Leaves, according to all appearance, are ſhut up a great many ſmall ones, but becauſe I could not unravel them ſo as to give the Limner a full view of them, I would not ſuffer him to take any notice of them, yet when I came to cut the Leaves acroſs as they lay involv'd in the bed of the Plant, I imagin'd that I ſaw the ſmall Leaves abovemention'd; and when I cut after the ſame manner that part of the Plant which is to be the body

and root of the Tree, I diſcovered within the ſmall Particle that which was deſign'd for the Pith, and even the Wood itſelf, and all that as plainly as if I had been obſerving with my naked Eye a young Plant of an inch thick.

. I endeavour'd as far as I was able, to deſcribe the contexture of the Pith, as it appear'd to me in Fig. 10. W X Y Z, in the ſaid Figure you may obſerve a great many ſmall Particles, which at firſt ſight one would be apt to take for irregular Globules, but plac'd in a right line, and all of them of greater length than breadth, but I look upon them to be nothing elſe but ſmall Pipes or Veſſels, whereby the Plant receives its nouriſhment, and who can tell but every one of them is cover'd with a diſtinct Membrane.

Theſe ſaid parts, which compoſe the Pith of the Plant are not to be diſcover'd, unleſs with a ſharp Knife you cut off a piece from the Seed after it is ſtript of the Seed, and place it immediately before the Microſcope; for all the moiſture is ſo ſoon exhal'd after it is cut, that one ſhall not be able to make any obſervation.

Moreover, for my own and others ſatisfaction, I took a little Copper-box, and put into it ſome Sand, which for its whiteneſs, and becauſe it is us'd to ſcour Tin, we call ſcouring Sand; this Sand was very dry, but was ſomething moiſtn'd by the Seeds which I mingl'd with it, having newly taken them out of an Orange.

This was done on the 19th of *November* in the Evening about 7 of the Clock, after which I carried the ſame Box adays in the Waſtband of my Breeches, where I us'd to put my Watch, and a nights I plac'd it within a large Tin Bottle fill'd with hot Water, which my people put into my Bed to warm it, by which means the little Box was alſo kept warm till the morning; and after I had repeated this practice three days following, I open'd the Box, and took out one of the Seeds, but could not diſcover any change in it.

On the 25th of *November* about 6 a Clock in the Evening, after that the Sand and the Seeds had been ſix days in a continual warmth, I open'd my Box again, and obſerv'd that the Root was puſht forth a ſmall matter out of the Membranes of the Seed, as you may ſee in Fig 11. A B C, A B being that part of the Plant which was to become the Root, and B C D the reſt of the Seed involv'd in its Membranes.

Moreover, I took another Seed out of the ſaid Box, which having cleanſed from the Sand, and ſeparated from its Membranes, I took the two Lobes ot the Kernel that incloſe the Plant, as you may ſee in Fig. 6 and 7, and with fine Pins parted them a little aſunder, that I might ſhow the top of the Plant deſcrib'd in Fig. 8. by O P Q.

Fig. 12. E F G H I repreſents the Seed, which, as I ſaid before, had lain ſix days in the Sand, and was diveſted of its Membranes.

E F ſhews that part which is deſtin'd for the Root, F G and I F are thoſe parts, from whence the young Plant receives its nouriſhment, and which by two Pins K and L are divided from each other, in order to diſcover that part of the incloſ'd Plant, which will be the body of the Tree, which is repreſented by H, and may be ſeen with the naked Eye.

Fig. 13. N O P Q R ſhews how far the Seed can ſhoot out its Root in 12 days, which is alſo diveſted of its Membranes, and plac'd ſideways before the Glaſs, that the Strings, whereby the two parts of the Seed are united to the Plant, may be the more eaſily diſcovered.

N O R ſhews the Root, O P and Q R the Seed or Kernel divided into two equal parts, O R the ſtrings united to the Plant, and from which it draws its firſt nouriſhment.

When I cut thoſe Strings acroſs and cloſe to the Plant, I found in each String three Veſſels, thro which I concluded that moſt of the Nouriſhment was derived from the Seed to the Plant.

I ſeparated the two parts of the Seed with two Pins from each other, that they might be the better viewed by the naked Eye, as you may ſee here in Fig. 14. S T X ſhews you the Root, T V and W X the two halves of the Kernel, and Y that part which is to become the body of the Tree, much larger than H in Fig. 12.

After I had proceeded with my Copper-box about 18 days after the manner above mention'd, I open'd the ſame, and caus'd the Limner to draw the Plants as far as he could ſee them ſpring out above the ſurface of the Sand.

Fig. 15. A B C D E repreſents the Copper-box, C the Seeds as they with their Plants and Roots were riſen above the Sand.

Fig. 16. F G H ſhews you the cover of the ſaid Box.

Having caus'd this Box be thus delineated, I pour'd out all the Sand from it, and then obſerv'd with great wonder, that all the moiſture was gone from the Sand, without doubt drawn away by the Seeds, of which I had put ſixteen into the ſaid Box, all which had ſhot out their Roots and produc'd Plants, ſome of which were indeed much bigger than the reſt; and two or three of the Seeds had brought forth double Plants, amongſt them there was one that yielded three Plants, which I have alſo caus'd to be drawn, tho the Roots and Plants were confus'd and jumbled together, which I attribute to the preſſure, and too great nearneſs of the other Seeds about it.

Fig. 17. A A A repreſents the ſaid three Plants, and B B B the three Roots.

When I obſerv'd how dry the Sand was which I had pour'd out of the Box, I fancy'd with my ſelf, that if I had put a little more Water into the Sand, or fewer Seeds, there would have been a greater increaſe both of the Plants and Roots.

Then I took a Glaſs Tube, that was large enough to hold the Sand conveniently, and hermetically ſeal'd at one end, and about twice as long as is here repreſented in Fig. 18.

18. I K L M N O; in this Tube I put 5 or 6 Seeds, and laid between each of them a little wet Sand.

This Sand was very fine and white, and of that ſort which is us'd for the making of Glaſs; I had taken it above 12 years ago out of a Glaſs-houſe, and had kept it always dry in my Cloſet in a Money-bag; it was digg'd, as I am told, in the Biſhoprick of *Liege.*

I proceeded with this Tube as I had done before with my Copper-box, having ſtopt it with a piece of Cork, *vid.* Fig. 18. L P Q M.

On the tenth day I obſerv'd that the Seed was come to that maturity, that the part which Nature intends for the body of the Tree, was grown up as high as the Cork; I pour'd a little Sand out of the Tube, that the Limner might more eaſily perceive the Germination of the Plant, and cut off part of the Cork, and upon the twelfth day it appear'd as in the ſaid Fig. 18. R S T.

Having done this, I took the Plant out of the Glaſs-Tube, and caus'd the Limner to draw it, as you may ſee in Fig. 19. A B C D E F G H, only you muſt obſerve that this Plant had but one Root A C D H, but becauſe others have more, I cauſed him to deſcribe them together, as you will ſee in B C.

In this laſt figure F G repreſents that part which is to be the Tree, D E the Seed or Kernel, which being ſurrounded with its Membrane, I took them off, that I might the better expoſe to your ſight thoſe parts thereof that ſerve for the nouriſhment not only of the Root, but of the upper parts of the Plant likewiſe, as alſo the ſhort ſtring D.

Now foraſmuch as I have obſerved in the Roots of ſeveral other Germinating Plants, that a great many ſmall Roots of unſpeakable fineneſs ſprung from them, I placed the ſame Plant, fig. 19. with that part of the Root which is deſcrib'd by C, before a common Microſcope, and then ſhew'd the Limner the infinite number of ſhort ſmall Roots ſpringing out of the great one, and cauſ'd him to draw it.

Fig. 20. K L M N ſhows a ſmall part of the great Root, which appear'd to the Limner as thick and as large as the ſpace between K and N, and the ſmall Roots appear'd growing out of the ſides of the great Root, as is repreſented between M and N.

Now if we conclude (as it is but reaſonable) that even the ſmalleſt Roots are ſurrounded with ſuch other rows of exceeding ſmall Roots, how ought we to be ſurpriz'd at the wonderful workmanſhip of God, and eſpecially when we proceed to the Diſſection and Anatomy of the Roots, (and the Body, and of all thoſe ſtrings which ſerve to convey its nouriſhment to the Plant) and to the obſervation of their Texture thro' our Glaſſes.

Thus we may ſee with our naked Eye, how a ſmall Particle no bigger than a courſe Sand (as the Plant is repreſented in Fig. 6. by C) is increas'd in bulk, within the ſpace of eleven days, as I have ſhewn already in Fig. 19. A H G F; and all this is brought to paſs by Heat and Moiſture in a cloſed Veſſel; a plain demonſtration that the Plant, and all that belong'd to it, was actually in the Seed, that is to ſay, not only the young Plant, its Body, Root and Fruit, but even the Seeds thereof alſo, in order to perpetuate the ſpecies, ſo long as the Earth ſhall have a being, and ſo long as the Sun ſhall ſhine upon it.

In the month of *December* laſt, I took another Glaſs Tube longer and larger than the firſt, as you may ſee Fig. 21. A B C D E F G H, and ſtopt both ends with a piece of Cork, boring a ſmall hole in the upper Cork, and filling the Tube a little higher than B G with dry ſcouring Sand, which I firſt moiſtn'd with a little Rain water; but one muſt take care of making the Sand too wet, for that will rot the Seeds, neither muſt it be too cloſely compreſt, leſt it ſhould hinder the young Plant from puſhing forth its Root or Branches.

In the upper part of this Sand thus diſpos'd, I ſet two Kernels of an Orange that was brought from *Curacao*; but whereas I put the other Seeds into the Sand immediately as ſoon as I took them out of the Orange, I did not ſet theſe laſt till ſome days after they had been out of theſaid Orange, for which reaſon they were dryer than the others, and conſequently demanded a longer time before they cou'd ſprout out, but in the ſpace of three weeks, by the warmth of my body only, they had Germinated, as is ſhewn in the ſaid Fig. B C F G.

Now, that the Limner might have a better view of the Seeds which were cover'd with Sand, I pour'd out ſome of it, and then they appear'd as B G G.

Between A B G H are repreſented the long Roots with their ſmall twigs and branches againſt the ſides of the Tube.

Since the above-mention'd time, I obſerv'd but very little change in the Plant in ſome days, the reaſon of which I ſuppoſe to be that all the moiſture was exhauſted by the Plant, wherefore I pour'd a little more Rain water into the top of the Sand, and then the Plant grew bigger, inſomuch that in five weeks time 'twas got almoſt to the uppermoſt Cork D E, and the Roots alſo were ſpread into more Branches, and had not only extended themſelves to the lower Cork, but one little Root had inſinuated itſelf between the Cork and the Glaſs, and had there ſhot forth another Branch.

Whereas the external Membranes of theſe Seeds are very thick and hard, and that part of the tender Plant which Nature has deſign'd for a Tree is not able to bore thro it, or burſt it aſunder, as happens in the Plants of Nuts, Almonds, Peaches, *&c.* The wiſe Creator of all things has found out an expedient for this alſo, to wit, that this Plant ſhall not ſpring up in a right line thro the Seed or Kernel, but out of the ſides thereof, as you may obſerve in Fig. 19. between D and F, and Fig. 22. between N and O.

After that one of theſe Seeds had lain near ſix weeks ſhut up in the Glaſs-Tube, and had grown in proportion to that time, I obſerv'd that one of its Leaves was wither'd or corrupted; whereupon I open'd both the Corks, and pour'd out the Sand, which being very dry came away eaſily, but a ſmall branch of the Root had ſo inſinuated itſelf into the Cork, that I could not ſeparate them without violence.

For your better ſatisfaction, I caus'd that Plant, with the Cork, as it was hanging to it, to be deſcrib'd by my Limner.

Fig. 22. I K L M N repreſents the ſaid whole Plant, whereof L M N ſhows the body, and foraſmuch as it had put forth 3 leaves at the top, M points out to you the ſaid Leaves.

I K L is the Root with its twigs and branches; L N O the Seed or Kernel ſtill ſurrounded with its Membranes; and laſtly, I P ſhews the Cork that ſtopt the bottom of the Tube, together with the Root ſticking to it.

Now if we renew the compariſon (which I have formerly made) between the Animalcula in *Semine Maſculino*, and theſe Plants; tho thoſe Animalcula are a thouſand thouſand times ſmaller than a Plant in an Orange-kernel; and tho we can't make our obſervations of the growth and encreaſe from time to time of the ſaid Animalcula in their Mothers Womb; yet we may firmly conclude that the Laws and Orders which the Great and Wiſe Creator of all things has preſcrib'd to himſelf in the production of his Creatures, both Animate and Inanimate, are homogenious and univocal, and that as the Earth is the common Womb of Plants, ſo is the *Tuba Fallopiana* in Animals of moſt of all thoſe Creatures that are form'd *ex Semine Maſculino*; for as the Animals in the Womb receive their Nouriſhment and Increaſe (as I have often ſaid) by a ſtring, till they come into the Air and World, ſo are all Seeds (at leaſt as far as we know) ſupported and fed by a little ſtring, nd the Seeds that are caſt into the Earth do again convey by the ſame ſtring, whereby they receiv'd their Increaſe, Nouriſhment to the Seed or Kernel.

We have diſcover'd that there are ſome Animalcula which have no Males among them, and the ſame is obſervable among a few ſpecies of Fiſhes alſo.

Theſe Animalcula and theſe Fiſhes may be compar'd to ſome Seeds, that have no other ſubſtance in them beſides the Plant itſelf and the Membranes that invelope it; ſuch are the Seed of the Beach-tree, and, if I miſtake not, the Seed of Creſſes likewiſe.

Amongſt the Seeds, whoſe Strings (whereby their Nouriſhment, *&c.* is deriv'd to them) I have not formerly diſcovered, there are the Wall-nut and the Cheſ-nut, but within a few days I have alſo found out their ſtrings.

A little while before the laſt Sickneſs and Death of the famous *Chriſtian Hugens*, Lord of *Zuilichem*, being together in his Study, he told me, that we were arriv'd to the utmoſt degree of knowledge in our obſervations of Heavenly Bodies, and conſequently that there remain'd nothing more to be ſeen or ſaid concerning them: I might likewiſe ſay, that we have penetrated ſo deeply into the great ſecrets of the Seeds both of Animals and Plants, that we ſeem to be at the end of our Diſcoveries; but however I may be miſtaken in thoſe Sentiments.

Now ſince I have been able, with a little Sand and Water, ſhut up in a Copper-box or Glaſs-Tube, and a moderate heat, to bring certain Seeds to maturity, which in our Climate are of a long and tedious growth, what can thoſe men ſay for themſelves that talk ſo much of the influx of Celeſtial Bodies, *viz.* the Sun, Moon and Stars, and that will not allow us to Plant and Sow our Seeds, but at ſuch an age of the Sun and Moon, and under ſuch a Sign and Conſtellation.

For my part, I know no other ſecret in Vegetation, but a compleat heat of the Sun, and a juſt quantity of Water nay, I ſhall not ſtick to ſay that the Increaſe and Nouriſhment of all Plants is included in Water; for let our barren and unfruitful Downs, that conſiſt of a very fine Sand, be brought to ſuch a Level that they lie but a foot higher than the Moats and Ditches round about them, ſo that the Rain water be not drain'd away as it falls, ſuch Land ſhall not only produce good Graſs, but even Rye, Barley, and ſeveral other Fruits.

III. *Some new Obſervations upon the parts and uſe of the Flower in Plants. By Mr* Sam. Morland.

THe nice and curious Texture of the Flower and its Furniture, obvious to common view, hath invited and employ'd the enquiries of many Learned and Sagacious Perſons. But ſince theſe noble Searchers into the Hiſtory and Operations of Nature, don't ſeem ſo happily to have reacht her deſign in this caſe as in many others, 'tis hop'd the Ingenious will not diſdain a new attempt to account for the Fabrick and uſe of theſe parts; whereby the propagation of Vegetables will be render'd more intelligible, and the ways of Nature appear more harmonious, and of a piece. It hath been long ago obſerved, that there is in every particular Seed a Seminal Plant conveniently lodg'd between the two Lobes which conſtitute the bulk of the Seed, and are deſign'd for the firſt nouriſhment of this tender Plant.

But the admirable Dr *Grew*, to whoſe generous Induſtry and happy Sagacity we are indebted for the beſt improvements of this part of Knowledge, is the only Author I can find, who hath obſerved that the *Farina* (or fine powder which is at its proper Seaſon ſhed out of thoſe *Thecæ* or

Apices Seminiformes, which grow at the top of the *Stamina*) doth ſome way perform the office of Male Sperm. But herein I think he falls ſhort, in that he ſuppoſes them only to drop upon the outſide or the *Uterus* or *Vaſculum Seminale*, and to impregnate the included Seed by ſome ſpirituous emanations or energetical Impreſs.

That which is now ſubjected to the diſquiſitions and cenſure of ſuch whoſe exquiſite skill doth conſtitute them Judges of ſuch Performances, is whether it be not more proper to ſuppoſe that the Seeds which come up in their proper *Involucra*, are at firſt like unimpregnated *Ova* of Animals; That this *Farina* is a *Congeries* of Seminal Plants, one of which muſt be convey'd into every *Ovum* before it can become prolifick; That the *Stylus* in Mr *Ray*'s language, the upper part of the *Piſtillum* in Mr *Tournefort*'s, is a Tube deſign'd to convey theſe Seminal Plants into their Neſt in the *Ova*; That there is ſo vaſt a proviſion made, becauſe of the odds there are, whether one of ſo many ſhall ever find its way into, and through ſo narrow a Conveyance.

To make this ſuppoſition the more credible, I ſhall lay down the Obſervations I have made upon the ſituation of theſe *Stamina* and the *Stylus* in ſome few ſpecies of Plants.

Firſt, in the *Corona Imperialis*, where the *Uterus* or *Vaſculum ſeminale* of the Plant ſtands upon the Center of the Flower, and from the top of this ariſeth the *Stylus*, the *Vaſculum Seminale* and *Stylus* together repreſenting a *Piſtillum*. Round this are planted ſix *Stamina*, upon the ends of each of theſe are *Apices* ſo artfully fixt that they turn every way with the leaſt Wind, being in heighth almoſt exactly equal to the *Stylus* about which they play, and which in this Plant is manifeſtly open at the top, as it is hollow all the way. To which we muſt add, that upon the top of the *Stylus* there is a ſort of *Tuft*, conſiſting of pinguid *Villi*, which I imagin to be plac'd there, to catch and detain the *Farina* as it flyes out of its *Thecæ*. From hence I ſuppoſe the Rain either waſhes it, or the Wind ſhakes it down the Tube, till it reach the *Vaſculum Seminale.*

In *Caprifolium*, or *Honey-ſuckle*, there riſes a *Stylus* from the rudiments of a Berry, into which it is inſerted to the top of the *Monopetalous* Flower, from the middle of which Flower are ſent forth ſeveral *Stamina*, that ſhed their *Farina* out of the caſes upon the orifice of the *Stylus*, which in this Plant is Villous or Tufted, upon the ſame account as in the former.

In *Allium* or *common Garlick*, there ariſes a *Tricoccous Uterus*, or Seed Veſſel, in the center of which is inſerted a ſhort *Stylus*, not reaching ſo high as the *Apices*, which thus overtopping it, have the opportunity of ſhedding their Globules into its orifice more eaſily. For which reaſon I can diſcern no Tuft upon this (as in the former) to inſure their entrance, that being provided for by its ſituation juſt under them.

The Reader, I hope, will excuſe me, if I preſent him now with ſome ſuch reaſonings or reflections as the foregoing account doth ſuggeſt, and will ſupport. And I can't but hope to perſwade thoſe that are candid, that I have aſſign'd to the ſeveral parts of the Flower I have mention'd their true and real uſe.

For nothing can be more natural than to conclude, that where a fine *Powder* is curiouſly prepar'd, carefully repoſited, and ſhed abroad at a peculiar ſeaſon; where there is a Tube ſo planted as to be fit to receive it, and ſuch care in diſpoſing this Tube, that where it doth not lye directly under the caſes that ſhed the Powder, it hath a particular *Apparatus* at the end to inſure its entrance. Nothing can be more genuinely deduc'd from any premiſes than from this it may, that this *Powder* or ſome of it was deſign'd to enter this Tube. If theſe *Stamina* had been only excretory Ducts, as has been hitherto ſuppos'd, to ſeparate the groſſer parts, and leave the juice deſign'd for the nouriſhment of the Seed more reſerv'd, what need was there to lodge theſe Excrements in ſuch curious Repoſitories, They would have been convey'd any whither, rather than where there was ſo much danger of their dropping into the *Seed Veſſel* again, as they are here.

Again, the *Tube*, over the mouth of which they are ſhed, and into which they enter, leads always directly into the *Seed Veſſel*.

To which we muſt add, that the *Tube* always begins to dye when theſe *Thecæ* are empty'd of their contents; if they laſt any longer, it is only whilſt the *Globules* which enter at their orifice, may be ſuppos'd to have finiſh'd their paſſage. Now can we well expect a more convincing proof of theſe *Tubes* being deſign'd to convey theſe *Globules*, than that they wither when there are not more *Globules* to convey.

If I could now ſhow that the *Ova*, or unimpregnated Seed, are ever to be obſerved without this *Seminal Plant*, the proof would ariſe to a demonſtration; but haivng not been ſo happy as to diſcern this, I ſhall recommend the enquiry to thoſe Gentlemen who are Maſters of the beſt Microſcopes, and addreſs in uſing them. Tho in the mean time, I have made ſome ſteps towards a proof of this ſort, and have met with ſome ſuch hints as make me not deſpair of being able, in a ſhort time, to give the World even this ſatisfaction. For, not to inſiſt upon this, that the *Seminal Plant* always lyes in that part of the Seed which is neareſt to the inſertion of this *Stylus*, or ſome propagation of it into the *Seed Veſſel*; I have diſcovered in *Beans* and *Peas* and *Phaſeoli*, juſt under one end of that we call the *Eye*, a manifeſt perforation (diſcernible by the groſſer ſort of Magnifying Glaſſes) which leads directly to the *Seminal Plant*, and at which I ſuppoſe the *Seminal Plant* did enter; and I am apt to think that the Beans or Peas which don't thrive, will be found deſtitute of it.

But I muſt now proceed to deſcribe ſome other Plants, whereby it will appear, that there is a particular care always exercis'd to convey this Powder, ſo often mention'd, into a *Tube*, which may convey it to the *Ova*. Now in *Leguminoſe* Plants, if we carefully take off the *Petala* of the Flower, we ſhall diſcover the *Pod* or *Siliqua* cloſely cover'd with an involving Membrane, which about the top ſeparates into many *Stamina*, each fraught with its quantity of *Farina*, and theſe *Stamina* are cloſe bound upon the *Bruſh*, which is obſervable at the end of that *Tube*, which here alſo leads directly to the *Pod*; It ſtands not upright indeed, but ſo bended as to make near a right angle with it.

In *Roſes* there ſtands a *Column*, conſiſting of many *Tubes* cloſely clung together, tho eaſily ſeparable, each leading to their particular Cell, the *Stamina* in a great number planted all round about. In *Tithymalus*, or *Spurge*, there riſes a *Tricoccus* Veſſel, that whilſt it is ſmall and not eaſily diſcernible, lyes at the bottom till 'tis impregnated, but afterwards grows up, and ſtands ſo high upon a tall *Pedicle* of its own, as would tempt one to think that there were to be no communion betwixt this and the *Apices*, which he ſees dying below.

In *Straw-berries* and *Raſ-berries*, the hairs which grow upon the ripe fruit (which I ſuppoſe may be ſurprizing to ſome) are ſo many *Tubes* leading each to their particular Seed, and therefore we may obſerve, that in the firſt opening of the Flower there ſtands a ring of *Stamina* within the *Petala*, and the whole inward *Area* appears like a little Wood of theſe Hairs or Pulp, which when they have received and convey'd their *Globules*, the Seeds ſwell and riſe in a carneous Pulp.

I have obſerved, and can deduce the contrivance and adminiſtration of the parts in all the Plants I have obſerved, and I doubt not but if thoſe Gentlemen whoſe penetration and leiſure is greater than mine, ſhall think fit to apply their thoughts to this ſubject, they will be able to perfect what I have rudely hinted, and from this Theory when ſome ſuch able hand ſhall have done it Juſtice, many Corollaries may be derived, which will let in light into many parts of Natural Philoſophy. I ſhall content my ſelf at preſent with ſuggeſting, that hence one would conclude that the *Petala* of the Flower were rather deſign'd to ſever ſuperfluous Juices from what was left to aſcend in the *Stamina*, then the *Stamina* to perform this office, either for them, or the unimpregnated *Semina*. And obſerve the Analogy between *Animal* and *Vegetable* Generation, as far as was neceſſary there ſhould be an agreement between 'em.

The Explication of the Figures.

Figure the 23 repreſents a yellow Lilly. A. the top of the *Piſtillum* or Tube, at which the Seminal Plants are ſuppos'd to enter, and thro which they are convey'd to the unimpregnated Seed in the Seed Veſſel.

b b b b b b. The *Apices Seminiformes*, which when they are ripe open, and ſhed that Powder which enters the Tube at A.

C. The place of the Seed Veſſel at the bottom of the Tube, the Seed Veſſel itſelf being conceal'd under the Leaf in this Draught.

Figure the 24th. D. The *Siliqua* in a Flower of the Pea-kind.

E. The Tube which ariſes from the *Siliqua*, and conveys the Plants to it.

F. The Membranous Coat that involves the *Siliqua* laid open.

g g g g g g. The *Apices*, which before the Membranous tegument is laid open, appear to riſe from its edges, and by the *Petala* of the Flower are kept cloſe upon the Orifice of the Tube, that they may conveniently ſhed their *Farina* into it.

Figure the 25th. A *French* Bean repreſented ſidewiſe.

Figure 26. The ſame open'd.

h. The Seminal Plant.

i. A Perforation, at which, 'tis ſuppos'd, the Seminal Plant firſt enter'd.

IV. *Experimentum Anatomicum ad veram Duræ Matris motus cauſam detegendam inſtitutum, ab* H. Ridley. *M. D. & Reg. Coll. Medic. Lond. Socio.* Sept. 20. 1703.

CUm novam plane, & ab ea quam olim in *Anatomia mea de Cerebro Cap.* 6. evulgata protuleram alienam, de motu illo Duræ matris reciproco qui in vulneribus cerebri, vel in Animalium vivorum ſectione viſui ſe offert, a *Cl. Viro Domino Georgio Baglivo Theor. in Roman Archilyc. Profeſſore* excogitatam in ſpecimine ſuo *Quatuor Lib. de Fibra Motrice* edito ſententiam nuper legerim ; mearum partium eſſe duxi, (nullo prorſus ad conſectanea illa quæ illius hypotheſi nitantur reſpectu habito, quæ adhuc forſan licet aliunde quam a ſe ipſa, uti in ſequentibus innuiturus ſum, motum ſuum Membrana hæc mutuatur, veritate ſua gaudeant) ut eorum gratia qui hactenus ſententiæ meæ acquieverunt, denuo quod ſuper hac re ſtatuiſſem ad examen revocarem ; eo ſcilicet fine, ut eos vel ab errore in quem culpa mea incidiſſent extricarem, vel ab aliorum præmunirem.

Quid igitur hic ſtatuit Cl. prefatus vir videre eſt, præterquam in pluribus aliis libri ſui locis, p. 20. ubi hæc ſunt. *Quo puero viſo, ſtatim ſuſpicari cæpimus quod Dura Mater fortes eos atque ordinatos motus non effecerit per arterias quæ in ipſa diſſeminatæ ſunt, verum per ſuam præcipuam texturam quæ cum textura Cordis æmulatione contendit* ; uti etiam paulo ſupra *Cor Cerebri* eam vocat. Poſtea p. (*viz.*) 29. Sequentia, *Quare cauſa pulſus Duræ matris in tota ejus mole & propria ejus ſubſtantia eſt, nec ab extra quæſita.*

Quid ego, qua autoritate, & quo experimento ſuffultus, in ſequentibus e vernaculo ſermone quo liber meus prodiit tranſcriptis Cap: predicto.

Hiſce ſinubus e veteribus plurimi, uti etiam e recentioribus aliquot, ſpeciatim Cl. Williſius, & Vieuſſenius Syſtolen more Arteriarum a quibuſdam uti ſenſerunt arteriis in iis terminantibus oriundam attribuere. Cum autem de horum aſſertione aliquantulum ambigebam, experimento ſequenti, quo controverſiæ finem imponerem, uſus ſum. Ligato apteque Compoſito cane, & portione quadam Cranij ejus ſublata, nullam omnino oculis conſpicere potuimus vel duræ matris, vel ejus ſinus longitudinalis pulſationem; Poſtea vero tantilla mora injecta, e predicto ſinu fortuito ferri caudentis uſibus aliis deſtinati occurſu diſrupto, violenta ſanguinis inſequenti effuſione, non niſi poſt inſignem vaſorum depletionem ſalienter profluxit ſanguis cum Pulſu iſtius Sinus totiuſque Membranæ ſat notabili. Sinum hunc per totum ejus longitudinem diſſecui, (irrito licet prorſus conatu) quo forſan ex Salienti rivo cruoris aliquarum arteriarum inſertionem (quarum plures juxta Vieuſſerium & ante illum a Doctiſſimo Wepfero illi inſertas fuiſſe per natopſiam dicebantur) internoſcrem.

Hinc ſatis conſtare videtur contra Cl. Bourdon, nullum alium Sinibus his motum competere, præter eum qui iis pariter ac Duræ matri ab arteriis per totum cerebrum diſperſis (coadjuvantibus ut ego exiſtimo quadam ſympraxi ijs quæ per Membranam ipſam ramificantur,) communicari ſolet uti olim *peritiſſimus Fallo p.* & *Volch. Coiter* & alij ſtatuerunt.

Hanc igitur ſententiam meam quo vel adhuc amplectar vel deſeram (nudam enim ſolum veritatem veneror) ulterioris Scrutinij ergo, experimentum ſequens inſtituturus ſum.

Canis ſuperiori parte bregmatis terebrata, Membranam duram non ſine aliqua Sanguinis jactura denudavi. Statim prius linteis carptis cohibita hæmorrhagia, ablutaque Sanguinis aſpergine, apparebat Membranæ iſtius, ejuſque Sinus longitudinalis qui per Marginem foraminis decurrebat, motus Syſtalticus cordis vibrationis quæ citatior ordinario erat, æmulus, eique rithmo ad amuſſim reſpondens.

Hanc mecum aſtantes vibrationem per ſpatium unius horæ quadrantis conſpexerunt, quo elapſo, eam hamulo acuto prehendere tentabam, ut ita ea ſuper ipſum ſuſpenſa,

&

& cultro diviſa, cerebri ſubtus motum ſatius expiſcarer, & ediſcerem: factâ autem ejus perforatione, (quam acute perſentiſcere canis videbatur,) cujuſvis antem Convulſionis expers, inſequuta eſt hæmorrihagia, ut prius, brevique ſimiliter reſtricta.

Eloto Sanguine, particulari iſto foramine a punctura hamuli in Membrana facto, comparuit Cerebri motus ſyſtalticus, parum id Sanguinis qui in eo hærebat, extus propellens.

Poſtea cuſpide forficis obtuſo caute in aperturam Membranæ vulneratæ immiſſa, eam tranſverſim, parte ejus a ſinus longitudinalis tranſitu maxime remota diſſecui, quo facto ſe protruſit cerebrum Pia Matre textum per iſtam aperturam, adhuc manente motu ejus ad tactum ſatis forti, licet membrana ipſa, ob vim reſtitutivam ſuarum fibrarum a plaga accepta diminutam, ad oculos obſcurius vibrari videbatur.

Toto hoc tempore vegetus erat canis, levibus tantum tremoribus cum quodam horrore per univerſum corpus affectus.

Poſt horas aliquot hiſce obſervandis tranſactas, quo tempore variis modis excruciatum fuiſſet animal, multumque ſanguinis effudiſſet, tandem ut omnem vim pulſificam quæ vel huic membranæ ineſſe, vel ei aliunde donari ſupponi poteſt ratione fibrarum ſuarum, quarum in cap. primo libri ſupra citati deſcriptionem fidelem cum earum varia propagatione & uſu dedi, quarum & beneficio motum primo a cerebro ſibi impreſſum validius abſolvit, adimerem, guttulas aliquot ol Vitrioli, unde nigro tingebatur colore, in eam leniter illenebam; Hinc nulla, ſaltem exigua & obſcura ejus percepta eſt vibratio; non obſtante autem hac ejus ad impulſum cerebri obſequendum ineptitudine, admoto digito ſatis diſtinctus cerebri pulſus ſentiebatur.

Peractis his, adhuc alacri manente cane, cum cultri mucronem ad unius unciæ craſſitiem in cerebri molem intrudiſſem, vehementer ſe agitabat canis, & in horribiles corporis jactationes, & pedum anteriorum & poſteriorum convulſiones incidebat; quo tempore immiſſo ut prius in aperturam prefatam digito, fortius ſe movebat cerebrum quam antea; Poſtea ſpecillum profundius adigebam, unde ſenſus dolorifici indicia maxima dedit; tandem cultro integro uſque ad latus cranij oppoſitum trajecto, horrendi exoriebantur ſpaſmi; & jam quo omnis de cerebri motu dubitatio amoveretur, digitis noſtris tum ego, tum adſtantes pari modo quo alias indentes, Syſtolen Diaſtolenq; ejus cum maximo renixu factam perſenſimus. Quid amplius ad veram genuinamq; motus hujus partis cauſam proximam meruendam detegendamq; deſiderari poteſt haud video, modo ad phœnomena in hoc experimento occurrentia, quæ omnia abſque ullo fuco, ut naturaliter ſe habebant, coram teſtibus omni fide majoribus fideliter enarravimus, ſedulo attendatur.

Ceterum ne deſint aliorum autoritates, inter plurimas quæ lucem aſpexerunt obſervationes ſequentem inſtar omnium juvat hic annectere, extantem in Miſc. curios German. decur. 2. An' 4 Anni 1685, obſ. 129 a *Theod. Moeren* que ſic ſe habet.

Grandis hæc contuſio & duram matrem Piamque Membranam ruperat, ipſamque cerebri ſubſtantiam confuderat, & ſanguis ſe ipſis cerebri Glandulòſis cavitatibus inſeruerat, quem ſtylo adaptato bombicino flore ſuaviter exſuximus, vulnereq; depurato, debitis Medicamentis extra intraq; adhibitis caput ligamentis involvimus.

Indies æſtimavimus mirandum, protuberabat enim continuo ſuo pulſu cerebri ſubſtantia ut ut fungoſa quæ ſui cauſæ ablationem in dies duplicatis, etiam vicibus requirebat, ubi apto linei ſuſſite non potuimus cavere quin non quandoq; hemorrhagiam inſuemus, que cogeret ut ſtylo etiam ad ipſos oculi tubos deſcendentis ſanginem a cerebri cavernis purgaremus, graviora ſui alias reſtagnatione ſymptomata cauſaturum.

Huic mihi olim conformem vidiſſe contigit, cujus ad multos dies quotidie tractationem a Chirurgo peritiſſimo cum ſingulis quæ notæ rarioris occurrebant ſymptomatis ſpeciatim & fideliter calamo exaratam adhuc ſervo.

Quod ſpectat ad hujus membranæ officium ei a cl. Viro aſſignatum, quo ſcilicet ſtrictus compreſſo cerebri Cortice copioſius gignantur diſpenſenturque Spiritus Animales ad nervoſas integri corporis partes remotiores.

Primo animadverti velim, quam profuſa Sobole Arteriæ Carotides cum cerebrum appellant per ſingulas ejus bri partes tum medulloſas tum corticales propagantur, ita ut juxta Oculatiſſ. *Malpighium* tertiam ad cæteras omnes in toto corpore proportionem gerere judicentur, quam egomet aſſertionem, cum eas, poſtquam primum ceram rubram in cæteras etiam univerſi corporis injeciſſem, ea repletas contemplaſſem, haud longe a vero abſuiſſe merito judicabam.

Secundo, Medullæ Spinalis, (ubi etiam Spirituum animalium generationem tum diſpenſationem continuam dari neceſſe eſt ut concedamus,) corticis inverſum prorſus ſitum, cum ſcilicet ille intus eſt & pars medulloſa ubi egrediuntur nervi extus, applicatio per ſe patet.

Hæc pauca habui ad quorundam Doct. Virorum olim ſententiam traditam ſtabiliendam, & cui me cogit experimentum olim factum etiam & ſupra recitatum dare ſuffragium, & cujus gratia ſolum hoc novum inſuper adjeci, quæ qualia qualia ſunt, animo ab omni invidia, contradicendi ſtudio, ſeu æmulatione libero publici juris eſſe volui.

V. *An*

V. *An Account of a Book, entituled,* Conſilium Ætiologicum De Caſu quodam Epileptico: Quo reſpondetur Epiſtolæ Doctiſſ. Viri Thomæ Hobart, M.D. Annexa diſquiſitione de Perſpirationis Inſenſibilis Materia, & Peragendæ ratione. Authore Gulielmo Cole, M.D. Coll. Med. Lond. Socio.

THe Author having received a very curious Letter from Dr *Hobart* of *Cambridge*, containing a remarkable Caſe of a Perſon, newly become his Patient, afflicted for four years with an *Epilepſy*, on which he requeſts his opinion, and his thoughts concerning the method of cure, to be uſed in it; adding withal ſeveral ſhort, but material, remarks concerning the *Inefficacy of Specificks*, the interpolate uſe of *Purgatives* according to *Dr Sydenham*, &c. Endeavours, in complyance with his deſire, firſt, to give an account of the particular *Seat* of the *Matter* of *Epilepſies* in the *Brain*; then to conſider the Method of *Cure*, and to anſwer ſeveral queſtions and doubts hinted in the Letter. The *Seat* he takes (from reaſons he alledges) to be the innermoſt region of the *Cortical* part of it, near where it turns into the *Medullar*, at which place he thinks (according to an Hypotheſis he heretofore delivered) the Nutritious Juice, newly ſeparated from the Blood, but happening to be ſomewhat more groſs than uſual, meets with a check, in its progreſs, on the account of the natural coarctation of the Veſſels here at their paſſing into the Medullar; ſo that, the protruſion being continual, it muſt undergo ſome congeſtion, and in ſome meaſure diſtend this Repoſitory; whereby being of an active nature, it gradually becomes maturated into a Ferment. This, when it has arrived at a certain degree of Acrimony, (partly thence, partly from the diſtention it makes) breaks forth into the continued channels of the Medullar part, and there, by vellicating them, begins thoſe terrible Symptoms of the Epilepſy. This matter, as well when ſo depraved, as naturally, muſt go forward along the tracts of the Nerves and Fibres, ſince it has no other way of excluſion, in which progreſs it may be preſumed to produce variety of Symptoms, on the account of the different ſituation of the channels and parts it paſſes through. And here he makes ſome kind of parallel between this Diſtemper and Intermitting Feavers, from a few reaſons, to be ſeen in the diſcourſe it ſelf.

Then he lays down the ſeveral adminiſtrations, which he conceives it requiſite to attempt the Cure by, annexing ſuch reaſons of each as appear probable to him: And though, in the firſt place, he declares he has no great opinion of the vulgar Specificks, (eſpecially till due evacuations are premiſed) and gives ſome reaſons of the Inefficacy of the Ancient Specificks in our Age, yet he quotes *Mr Boyle* for the efficacy of one, viz. true *Miſletoe of the Oak*, and lays down one Inſtance of the good effect of it, upon his own Experience.

Then he conſiders the uſe of Evacuating adminiſtrations, as, firſt, Phlebotomy; then Fontanels, particularly a Seton; afterwards Purgatives; where he endeavours briefly to juſtifie *Dr Sydenham's* advice of giving Purgatives in Maniacal affects upon preciſe days; then mentions, and only mentions here, *Inſenſible Perſpiration*; ſince he ſubjoyns a diſcourſe concerning it at the end of this Letter.

Then he proceeds to conſider ſeveral queſtions and doubts, which *Dr Hobart's* Letter raiſes or hints; as firſt, one Phœnomenon concerning the Patients Head growing firſt hot in the beginning of the Paroxyſm, then a coldneſs ſeizing him; in a contrary courſe to that of Intermitting Feavers: Then the uſe of Tobacco, Stale Beer, but more particularly Sweet ſmells, which refreſht him; where he takes occaſion to diſcuſs that queſtion, whether Smelling be performed by an admiſſion of the odorous particles into the olfactory Nerves at their extremities, or only an impreſſive on them; and adds withal an attempt at a reaſon, why ſweet ſmells may be agreeable to *Epileptick* perſons (as in the preſent caſe) but are apt to occaſion *Hyſterick* Fits, though the Symptoms of both theſe diſtempers ſeem to have a great affinity.

Having reply'd to the moſt material parts of the Letter, he comes to give an account of the Matter and Manner of *Inſenſible Perſpiration*, from an Hypotheſis, which he believes to be wholly new, and his own, as not having met with it either in any Author or in diſcourſe. For tho' the celebrated *Sanctorius* hath from thirty years obſervation demonſtrated the ὅτι of it, without contradiction from any, yet neither he, nor any ſince, having (ſo far as this Author has obſerved) attempted to give a *Rationale* of it, nor diſtinguiſht the *Matter of it* from that of *Sweat*, on which diſtinction he founds his Notion, he preſumes his thoughts on this ſubject will not be altogether unacceptable.

He takes notice therefore, that 'tis the general opinion, that the Matter of both theſe evacuations is the ſame, and that they differ only according to the greater or leſs proportion of the Matter excluded, and that theſe perſons thence form an Indication of curing moſt Diſeaſes by Sudorificks. But he being of a very different notion, endeavours to make it out from ſome conſiderations and reaſons.

And *Firſt*, He conſiders, that the Matter deſign'd by Nature to be evacuated at the *pores in the Skin*, is of two ſorts, *viz.* Either the ſuperfluous *Serum*, or other Subſtances which make up the Blood, which, on the account of their Figures and Bulk, when impelled by the Heart, are adapted to paſs through duly figured Strainers, which they find there: Or elſe, the particles of the *Nutritious Juice*, which having either been aſſimilated, but now become effete, or been brought in a larger quantity than the Nutrition of the part requires, muſt ſtill go on to the extremities of the Veſſels that carry them, till the continued protruſion from above caſts them forth.

Theſe two Liquors he takes to be of very different kinds: The *former* conſiſts of very various ſorts of particles; the *latter*, tho' not ſimply homogeneous, yet he ſuppoſes to be leſs heterogeneous than the others: And beſides, conceives they muſt be carried along by very different degrees of motion.

Secondly, he conſiders, That, as theſe Subſtances are ſo very different, ſo, he thinks, 'tis requiſite there ſhould be two different manners of their excluſion; one by means of *Secretion*, the other by a bare *Protruſion.* As to the former, he thinks it probable, that ſince the particles of the Maſs that affords theſe, *viz.* the Blood, are ſo very heterogeneous, and this maſs ſo briſkly agitated, 'tis neceſſary a determinate organization and mechaniſm of ſome parts ſhould be had to make the Separation; and theſe parts, where this is effected, we call *Glandules*. As to the latter, it ſeems obvious, that, ſuppoſing there are paſſages for the conveyance, a ſimple openneſs of the Pores at their extremities is ſufficient for it.

Thirdly, he conſiders, that 'tis requiſite, in order to his explication, to lay down the *method of Nutrition*, which tho he hath formerly done, (*Tr. de Feb. Interm.*) yet he thinks it neceſſary to recapitulate it here, ſince the main of his Hypotheſis depends on it.

Here he, firſt, ſummarily gives ſo many *Requiſites* of Nutrition as he thinks ſufficient for a foundation. As firſt, that the parts to be nouriſhed be of ſuch a ſtructure, as eaſily to admit the Subſtances to be appoſed, and let them paſs off when effete. Secondly, that it be bounded; thirdly, that it ſhould have a rectitude of paſſages; fourthly, that the protruſion of the nutritious Matter ſhould be continual; fifthly, that it ſhould be ſlow.

Which conſiderations premiſed; He thinks, that the former ſort of Subſtances (thoſe *of the Blood*) are the Matter of Sweat, the latter (thoſe *of the Nutritious Juice*) are that of *Inſenſible Perſpiration*; Thoſe to be *ſecreted* by the Glandules (as Machins); Theſe excreted by the Fibres (as ſuch) and that by a bare *protruſion* along their tracts.

Yet he thinks not that the whole Matter of Sweat is always only what is ſent off by Secretion; no more than he does that upon Inſenſible Perſpiration nothing paſſes forth but the aſſigned ſuperfluities of the Nutritious Juice: Since for ſome reaſons he aſſigns, ſomething may paſs out of either of thoſe kinds of Veſſels to encreaſe the matter of either evacuation. But he thinks it ſufficient to denominate the matter of each from the greater part. Of which more below.

And that the matter in general of theſe two Evacuations is different, he endeavours to prove by two Arguments.

The *Firſt* is taken from Experience: But he is not ſo vain to urge his own, but that of *Sanctorius*, whom all learned men value; who from 30 years experience, in a great many of his Aphoriſms aſſerts the wide difference between the effects of theſe two evacuations.

But becauſe ſome affirm they have ſeen conſiderable and good effects of Sweats in ſeveral Diſeaſes, and that others enjoy their health, notwithſtanding they frequently and copiouſly Sweat much, he endeavours in ſhort to anſwer theſe objections, as may be ſeen in the Diſcourſe itſelf.

His *Second* Argument he takes from the reaſon and manner of Nutrition: which ſince ſome deduce immediately from the Blood, but He himſelf (as he has formerly endeavoured to prove) from the Nervous Juice; he conſiders both theſe ſuppoſitions, laying down the manner how either way the buſineſs may be preſumed to be performed: but more particularly, relying on his own Notion formerly delivered, he gives an abſtract of it, and then proceeds to ſhew, how this Perſpiration may be mechanically ſolved from it, *viz.* ſuppoſing that the Brain, and conſequently all the Fibres (which make up the whole body; and are, according to him, Veſſels) are relaxed in ſleep, and ſo admit the ſupplements of Nouriſhment, he infers, that upon waking firſt the Brain, then the whole Nervous Syſtem muſt fall into contractions, and ſo protrude what lay before this freſhly admitted nutritious Juice, toward the extremities of theſe Veſſels in the ſurface of the Body, out of which, being continually open, they muſt paſs now plentifully, and thence he accounts for *Sanctorius*'s *Perſpiratio major* at this time, which done, 'tis obvious it cannot proceed ſo plentifully all the day, tho ſtill the protruſion being inceſſant, ſome muſt go forth.

But becauſe he ſuppoſes, that both the matter of this Perſpiration and Sweat paſs forth at *the ſame Pores* in the Skin, he endeavours to ſolve this doubt, by conſidering the *Glandules* (which make up the Skin) either as made up of theſe *Fibres*, or as *Secretory Organs*, and ſuppoſes, *Firſt*, That what the Fibres, as ſuch, contain, muſt by the before-mentioned protruſion be continually, carried on to their extremities, which lye every where within the cavity off theſe Glandules, as well as at their ſurface, and ſo paſs off into thoſe cavities ; but *ſecondly*, In the other conſideration theſe Glandules having a Secretory duct, which all along makes their cavity, the ſuperfluous or much exagitated ſeroſities of the Blood make their way into the Roots of it, and ſo muſt be continually carried on the ſame way that the other Liquor goes.

But ſince he believes his *Hypotheſis New*, he conceives it requiſite to elucidate ſome things not before ſufficiently explained, and therefore endeavours to examine the Source and Nature of this perſpirable matter, and to aſſign briefly the *advantages* of inſenſible Perſpiration, and the *hurt* of immoderate Sweats.

He thinks therefore that the matter of this Perſpiration proceeds immediately from *three Springs*, the *Nutritious Juice*, *Blood* and *ſolid Parts*. And though he takes the firſt to afford the far greateſt part of this matter, yet he denies not that ſome part of it may be ſupply'd by the other two. And firſt, *The Blood* abounding with great numbers of very ſubtile particles, and all parts of the Body being porous, 'tis very likely that ſome will ſecede at them, but it being both very Heterogeneous, and blended by the violent circulatory motion, and withal much of it fitted to paſs off at the Secretory Ducts Nature has framed for that purpoſe, 'tis but little of it that can paſs this way. Then as to the *ſolid Parts*, Theſe being firſt made of the Fluids, muſt as they decay return into them again, and ſo paſs off the ſame way, that the ſuperfluities of the Nutritious Juice does. But then as to the *Nutritious Juice* it ſelf, which he conceives is carry'd to all parts by the Fibres, he conceives this ſupplies the great matter of Perſpiration ; which he endeavours to evince by two Arguments.

Firſt, From the *Plenty* of it, which *Sanctorius* aſſerts to be ſuch, that five parts of eight of the aliments which we take in, paſs off this way, as his ſtatick Experiment evinces.

The Plenty of it he endeavours to prove by the conſideration that all our primary Liquors are deſigned chiefly for Nutrition, and conſequently ſince our bulk is large, and our daily expences great, we need a great quantity of it: Now for the diſcharge of what has done this Office, Perſpiration ſeems the fitteſt way, ſince we are nouriſhed to the very ſurface of our Bodies, and that by conſtant Tracts from within.

His ſecond Argument is from the *Utility* of this Perſpiration, and the *Inconveniences* proceeding from a ſtop of it.

The Utility, he ſays, conſiſts in the preſervation of Health, and the reſtitution of it when wanting. Though he appeals for this again to *Sanctorius*, yet he offers beſides, ſeveral deductions to prove it. On the contrary, he thinks 'tis obvious, that a check of it muſt be prejudicial.

Here he endeavours to anſwer an objection raiſed againſt the quantity of it, which *Sanctorius* aſſigns, from Experience (particularly Sir *John Floyer*'s) as ſuppoſing that *Sanctorius* would be underſtood only of his own Climate *Italy*, or ſuch like. But thinks that, be the quantity greater or leſs, 'tis ſufficiently great to ſhew we perſpire conſiderably.

He conſiders alſo another ſuggeſtion, *viz.* That the Blood may be preſumed immediately to ſupply the matter of it. Then he goes about to ſhew more particularly, wherein the *preſervation* of Health, and the *Cure* of Diſeaſes (at leaſt thoſe, which are general, conſiſts. The former he takes principally to be effected by the removal of thoſe Impediments, which would hinder Nature in her regular working. The latter by diſcharging this way the matter, both continent, and antecedent of them already formed, ſince ſooner or later there is little of it but what moves to the circumference.

Of the ſubject, wherein the matter of theſe reſides, he gives a ſhort Scheme.

But becauſe it may be objected, that all the Diſeaſes touched at, which lye deepeſt, cannot be carried off by Perſpiration; he thinks that even theſe owing their original to ſome fault in Perſpiration, this ought to be conſidered, tho more remotely, as part of the cauſe, and ſo being promoted, may carry off ſome of the Matter. But not deſigning to diſcourſe of all Diſeaſes particularly, he chooſes to range them under that old diſtinction of *Acute* and *Chronical*, and ſuppoſes according to the vulgar opinion, that the former may more immediately have their ſeat in the Blood, and the latter in the ſolid parts, *viz.* the Fibres.

Of Diſeaſes referred to the *Blood* he ſuppoſes Feavers to be the moſt general, tho withal he reckons all Inflamatory diſpoſitions to belong to this head. Though he think Perſpiration more conducive to prevent theſe than cure them, yet he denies not its uſe even to this end, for the reaſons he in ſhort aſſigns.

But he ſuppoſes its uſe is greateſt in the Cure of *Chronical* Diſtempers, which he founds in the Nervous Syſtem. Theſe he conſiders either as *General*, and affecting the whole body, or as *Particular*, reſiding in ſome private part. The former, he conceives, muſt have their ſeat in ſuch a place, that they may influence the whole body, *viz.* in the Nervous Syſtem. And tho' the Blood is carried every where, yet being ſo eaſily diſſipable as 'tis, he thinks it can hardly be the Seat of ſuch long diſtempers; Though the Jaundice be an inſtance on the other ſide: But he endavours to ſolve that.

Of theſe general Chronical diſtempers he mentions only a few of the moſt remarkable, the very naming of which gives all men an Idea, that they reſide in the nervous Syſtem, and conſequently that the Matter may be moſt readily carried to the circumference of the Body, and ſo paſs out at the pores.

But tho' the diſeaſes of private parts cannot be ſo cured by reaſon of their ſituation, yet he thinks, that part of the antecedent matter of them being carry'd off by Perſpiration, the reſt will be more eaſily digeſted.

Here he takes notice (for the ſervice of the *Fair Sex*) that a duly regulated Perſpiration is very conducive both to procure, and continue *Beauty* to a long date, ſome reaſons of which he alledges.

Having thus ſhown (tho in ſhort) the *advantages* of *Perſpiration*, he comes likewiſe to touch upon the *injuries* that *Immoderate Sweating* doth frequently to thoſe who indulge themſelves in it.

As, firſt, the Blood is by it robbed of its Serum: 2dly, The inteſtine motion of it becomes diſturbed; 3dly, The tone not only of the Glands, but the whole Body becomes too much [illegible]; 4thly, The Secretions in order to Nutrition cannot but be much perturbed by it. Only *Critical* Sweats he thinks are far from being prejudicial, as being of a concocted matter.

But whereas he owns that the Matter of this Perſpiration may be thrown off, ſometimes by Sweat, ſometimes by Urine, and ſometimes by Stools; he attempts to ſolve that difficulty agreeably to the Mechaniſm of the Body, and native tendency of the Liquors, tho briefly, as may be ſeen in the Diſcourſe it ſelf.

Then he endeavours to ſolve another difficulty, raiſed from the conſideration, that the greateſt part of the Fibres may be terminated within the Body, and thence to ſhow how theſe fewer Fibres terminated at the Skin may be ſufficient for this evacuation.

That done, he propoſes a Paradoxical Problem to be conſidered, *viz.* whether all the Fibres in all parts of the Body may not at their terminations naturally form Glandules; and ſo the whole Body may not be glandulous; and this he doth from three or four conſiderations.

At laſt he propoſes a method and ſome means of promoting this Perſpiration, when 'tis conſiderably check'd. And *Firſt* he adviſes Phlebotomy; *Then* Faſting for a day or two, partly to ſpend the congeſted Matter of it, and partly to digeſt the reſt; only he conceives a moderate quantity of thin Liquors uſeful; and withal thinks, that a quiet compoſure at this time may be moſt uſeful to this end. *Thirdly*, He adviſes the uſe of a Body-bruſh every morning for ſome time. *Fourthly*, if theſe ſucceed not, he adviſes moderate Purging, having firſt uſed ſome Digeſtives. *Fifthly*, Since we abound with Volatile Salts (and perhaps our Animal Spirits are little elſe) he adviſes a prudent uſe of them. *Sixthly*, If yet it proceed not, he adviſes warm Bathing. But if notwithſtanding it proceed not rightly, he propoſes, *Seventhly*, the Uſe of Cold Bathing. Of all which he aſſigns, in his ſuccinct way, ſome reaſons.

He concludes with alledging the benefit, that he hath found himſelf by practiſing it; but would not have any rely on that, but make tryal of it themſelves, ſince 'tis both eaſie and pleaſant; no more going to it, than to lye quiet in Bed, the Hands covered, for half an hour or longer, after full waking reſolving to ſleep no more, taking care in the mean time carefully to avoid Sweating, which, tho it may have its uſe in ſome caſes, where ſeroſities abound in the Blood, yet is here ordinarily prejudicial, not only in his Opinion, but Experience in himſelf.

LONDON, Printed for *Sam. Smith*, and *Benj. Walford*, Printers to the
Royal Society, at the *Princes Arms* in St *Pauls Church-yard*, 1703.

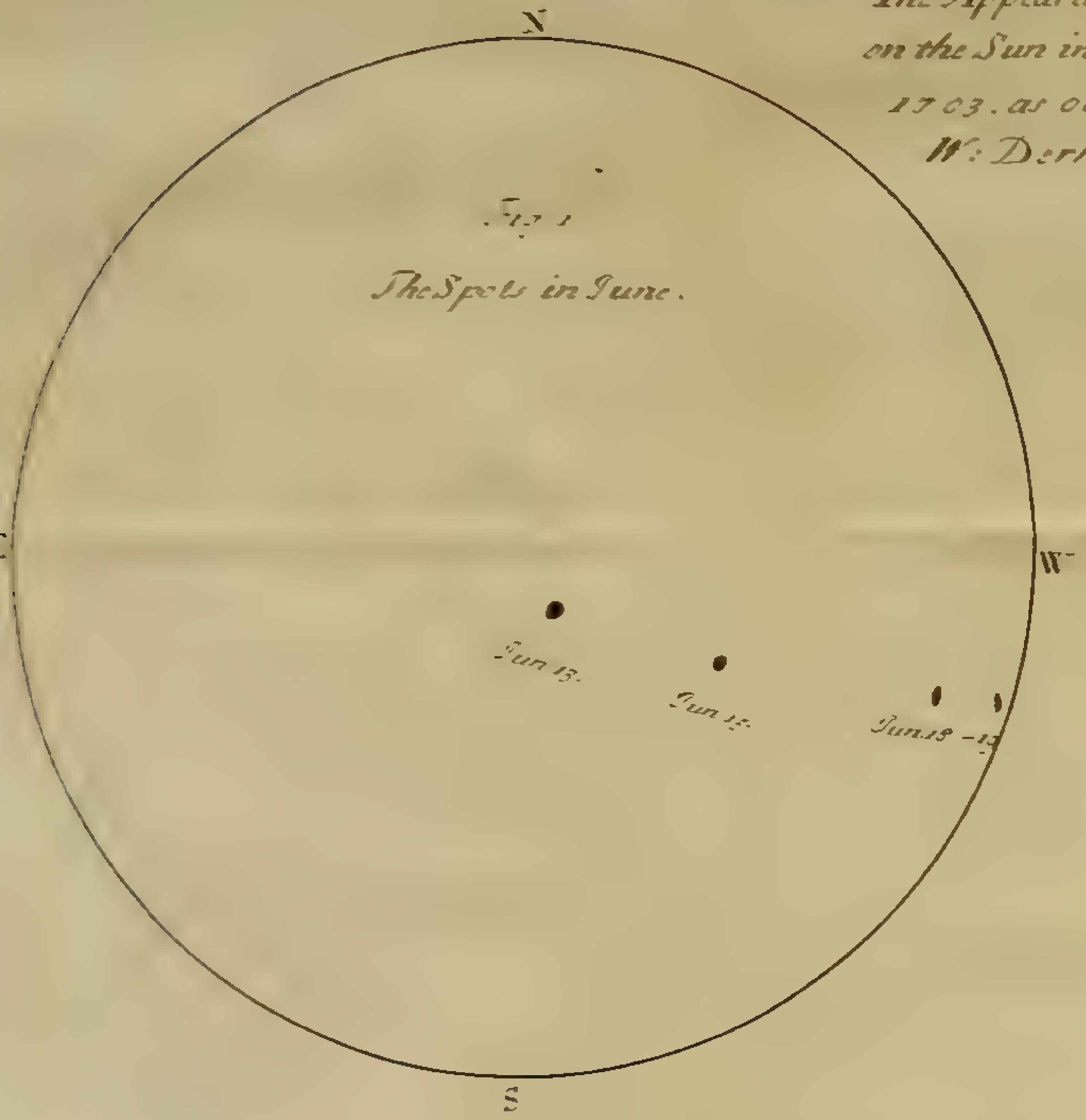
ERRATA.

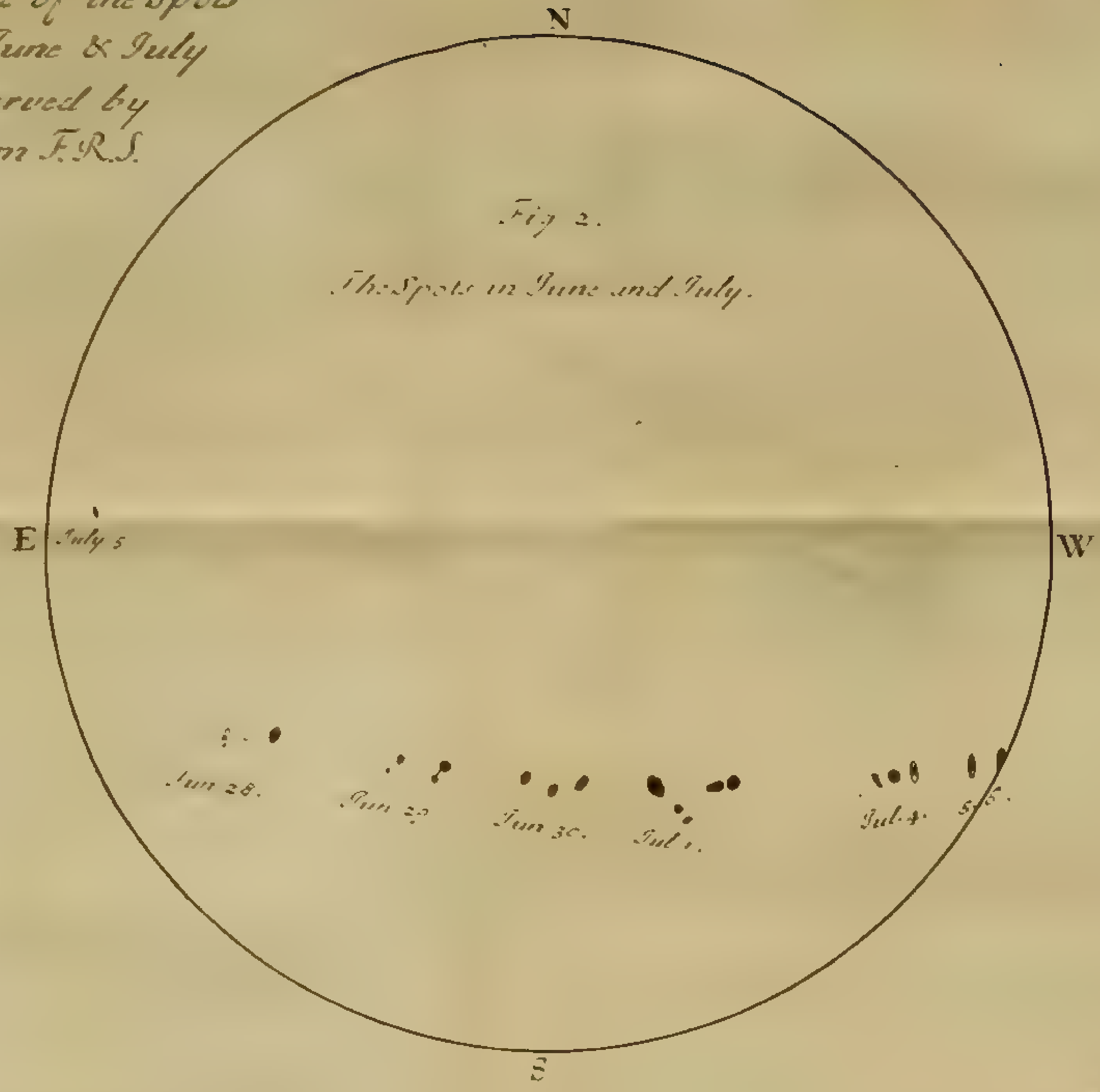
No 286. p. 1417. l. 16. for Picture r. Poſture. p. 1418. l. 7. for Weather r. Water.

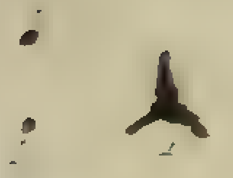
(1493)

BRITISH MUSEUM

The Appearance of the Spots on the Sun in June & July 1703. as observed by W: Derham F.R.S.



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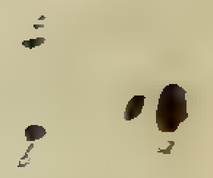
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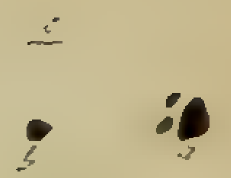
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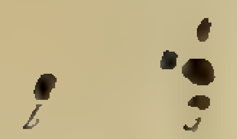
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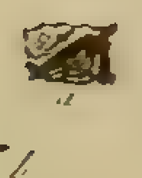
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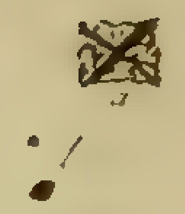
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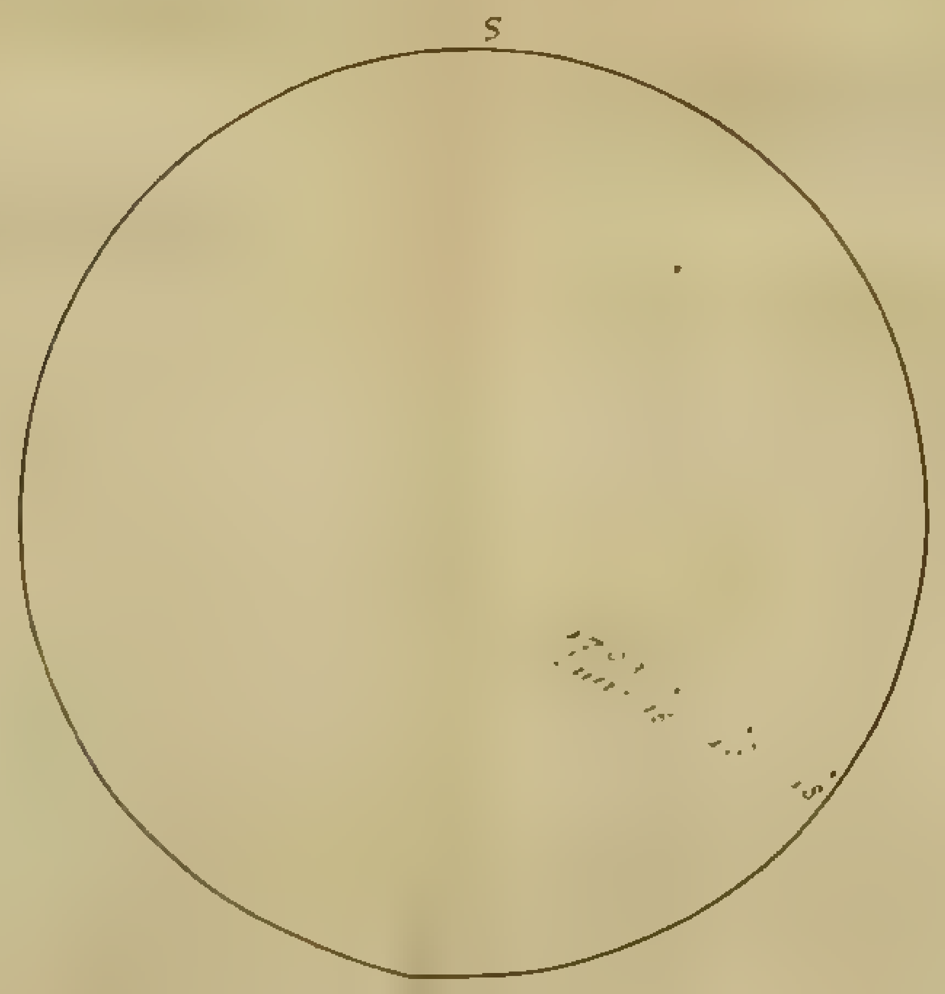

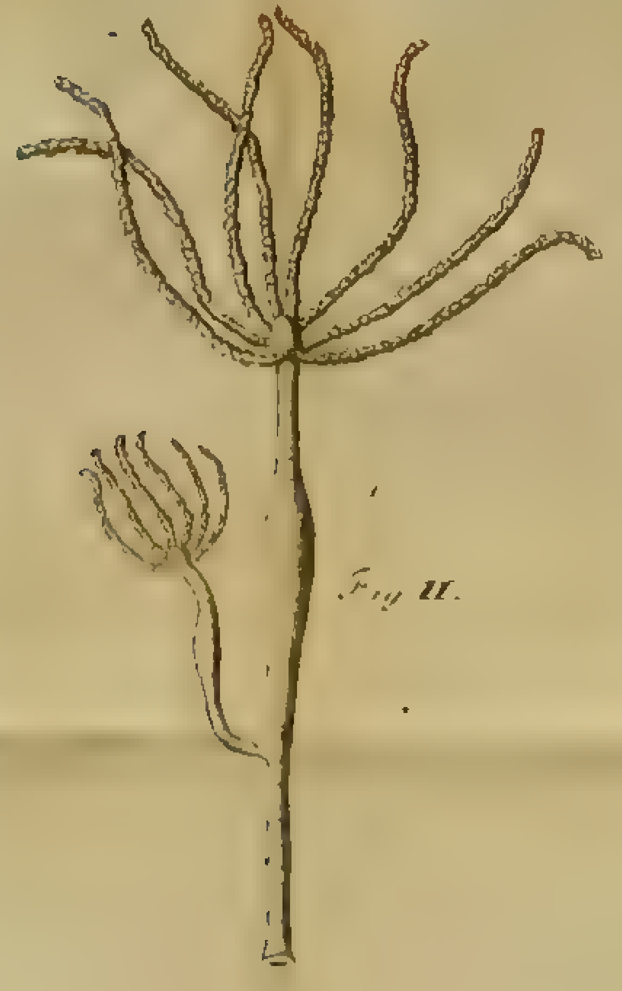
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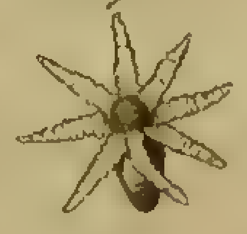
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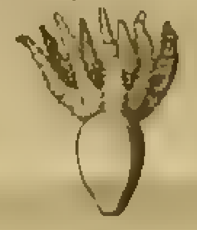
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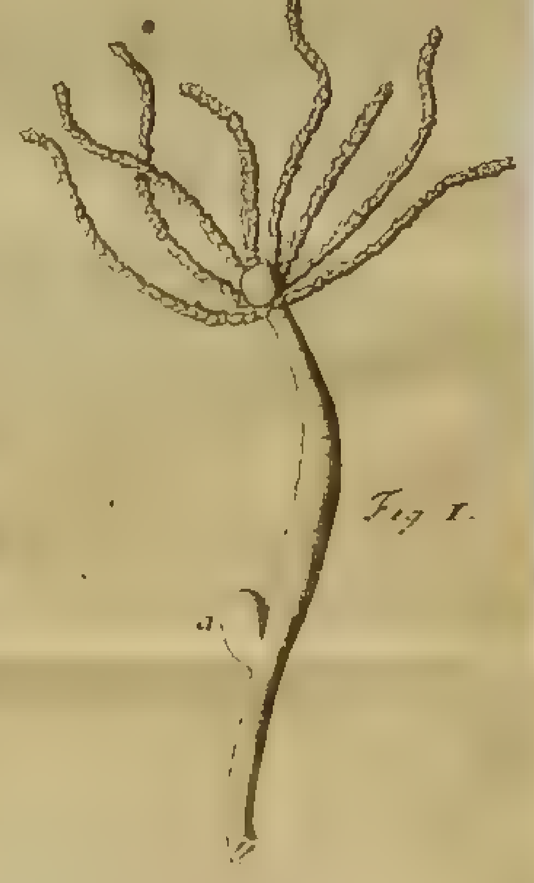
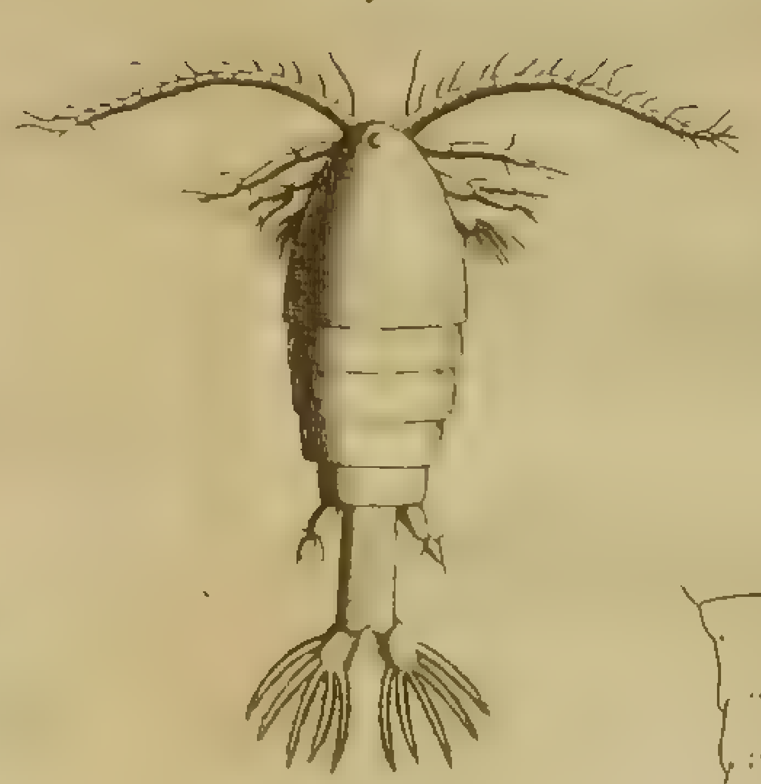


Fig I.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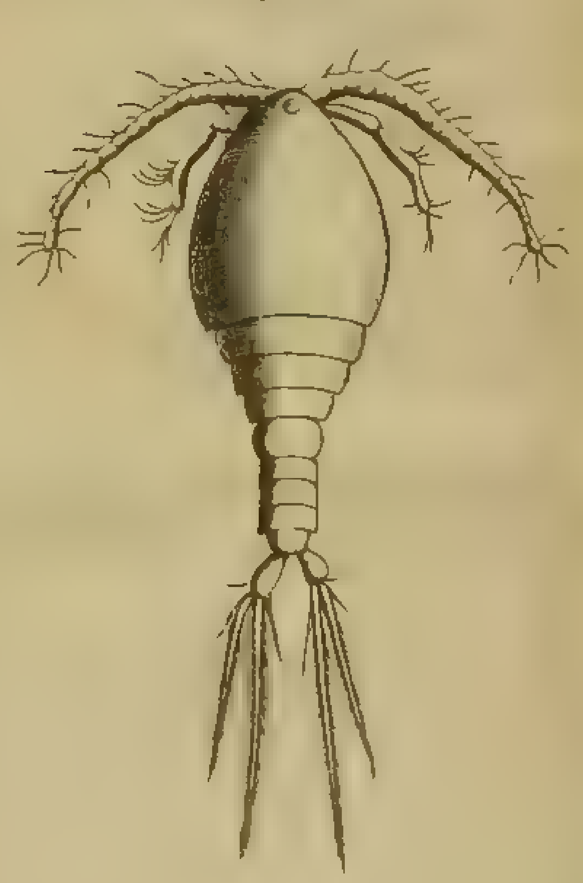


Fig V.

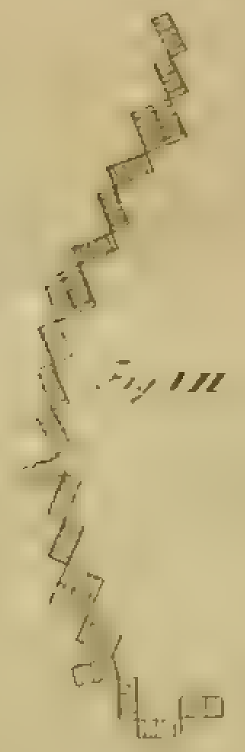
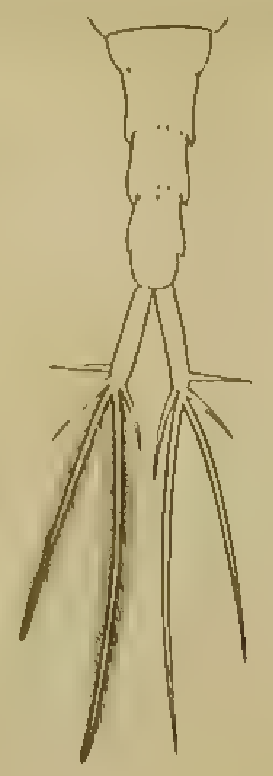


Fig VII

Fig VIII



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PHILOSOPHICAL TRANSACTIONS.

For the Months of November *and* December, 1703.

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I. *Two*

I. *Two Letters from a Gentleman in the Country, relating to Mr* Leuwenhoeck*'s Letter in* Tranſaction, *No.* 283. *Communicated by Mr* C.

June 21.

Dear Sir,

YOurs of the 10th inſtant found me at *W.* where I alſo met the Tranſact. No. 283. which you ſent laſt. Finding ſomething in it from *Mr Leeuwenhoeck*, I greedily run it over, and muſt own that I was a little mortified to ſee in it an account of a Creature which I thought I had a ſort of Propriety in, and of which I had made a Draught, with a deſign to preſent you and Mr *C.* with a rarity, which I believed no body had met with but my ſelf. However, Mr *L.*'s Picture of it being ſo ſmall, I thought my Sketches would not be unacceptable, becauſe they not only confirm his account, but may contribute to give you a more perfect Idea of ſo odd an Animal: I found it the beginning of this Month in ſome clear Water, which I took up in a Ditch at *W.* in which, with my utmoſt attention, I could diſcover no more than this one of the ſame kind. Fig. I. repreſents it in one of the poſtures it appear'd the firſt day (for it varies every moment) and the knob at *a*, which lookt like the Gut *cœcum*, was ſometimes a little more lengthen'd; two days after I could perceive two or three white Fibres at the end of it, and on the fourth day, the Animal lying ſtretch'd at its full length, appear'd as in Fig. II. and I plainly ſaw, that what I thought an excreſcence was a young one, with 6 horns coming out of the ſide of the old one, and the next day I found it in the Water entirely ſeparated from the body, and was about one third of the length of the Parent. The formation of the horns are well figur'd by Mr *L.* and they iſſue (like *radij*) not from the extremity, but quite round a ſmall knob, which I take to be the Head. The Horns have a vermicular motion, and are extended or ſhorten'd both altogether and ſeverally. The other end is flat at the extremity, and he often fix'd it (like a *Leech*) to the bottom or ſide of the Glaſs in which I kept him. He alſo contracts and dilates his body at pleaſure, and eſpecially, when touch'd or diſturb'd, will bring both Body and Horns into a ſmall compaſs, and has then the appearance of Fig. 3, and 4. The Horns are perfectly white, and the Body yellowiſh, and to a naked Eye not eaſily diſcernable in the Water, it being when extended no thicker than a good Horſe-hair.

The ſmall Plant mention'd in the ſame *Tranſact.* is the *Lens Paluſtris* or *Duck-meat* , which floats plentifully on our Ponds or Ditches. But I muſt diſſent from Mr *L.* where he ſays it does not come originally from the bottom, for I very well remember that many years ſince, the late *W. Ch.* Eſq; ſhew'd me the manner of its ſpringing out of the Mud; and we often obſerv'd, that when the Leaves were grown to a competent ſize, the force of the Water eaſily drew the minute ſingle fibr'd Root, and rais'd the Plant to the ſurface. I own that the Leaves when floating do continue to grow, and may be encreas'd after the manner he mentions, and I have often taken the young Plant which he pictures out of them, ſo that they may be call'd Seeds more properly than Leaves; and my opinion is, that toward the end of the year, upon their corruption they ſink to the bottom, and there take root, ſo as to continue the ſucceſſion.

The *Animalcula* which Mr *L.* deſcribes ſticking to the Root of the Plant, I have often obſerv'd, not only in Water Plants, but adhering to the bodies of many ſorts of

Water Inſects, which I have ſeen cover'd almoſt all over with Tufts of them, each Tuft being made up of many *Animalcula*, which appear not much unlike to the Flowers of a Lilly or *Fox-Glove*.

This Congeries of *Animalcula* will lengthen and contract themſelves both altogether and ſeverally, and I have obſerved them, when they lye at length, to put out ſome wonderfully minute Organs like ſmall Feet (not eaſily diſcern'd even with my beſt Glaſſes) which by their quick agitation bring a current of Water from all ſides toward them. But I was never ſo fortunate as to ſee that motion in them, which he ſays is like that of a Mill wheel; nor indeed can I perceive the poſſibility of ſuch a Rotation of any Member in an Animal mechaniſm. But I think I can eaſily account for this miſtake of Mr *L.* or rather of his Painter; for in the ſame Water wherein I have ſeen theſe Plants and *Animalcula*, I have obſerved a ſmall round Creature, whoſe many Legs ſtand like *radij* all about its Body. This has a ſwift progreſſive motion, but will very often lye ſtill (when only you can perceive thoſe *radij*) and then turn very ſwiftly round like a Wheel, ſometimes one way, and then ſtop and turn the other way, without ſtirring an hairs breadth forward. Now 'tis very probable that one of theſe might ſhew its tricks ſo very near to, or among a Tuft of the other fix'd *Animalcula*, that it might be very well taken for part of the ſame, and I am very confident this is matter of Fact.

Theſe *Animalcula* are ſometimes ſeen looſe, but generally they are fix'd in cluſters by their Tails to other Bodies, and perhaps cannot ſeparate themſelves; and I think it no mean inſtance of Providence, that many kinds of Water Inſects which are ſo fix'd, and even ſome of which have but ſlow and irregular motions, are furniſhed with ſuch Organs about their Head, the vibrtion of which, brings a conſtant current towards their Mouths, and with that, Food for their Support, otherwiſe they would be ſtarv'd for want of Nouriſhment.

If you ask what Inſects thoſe are, on whoſe Bodies I have ſeen theſe *Animalcula*, I muſt tell you they are of divers ſorts, and that I have obſerv'd no ſmall variety in the water of our Ditches, not only of reptiles and the Catterpillar kind, but of Eeles and perfect Shell-fiſh, both Cruſtaceous and Teſtaceous, and have been ſo pleas'd with the Beauty of ſome of them, that I have kept them many weeks by me, as an agreeable entertainment for ſuch as are curious; and farther deſign'd, if I could have met with a good hand in the Country, to have got ſome Figures of them, which I had attempted my ſelf, but with no ſatisfaction. However, having preſerv'd two tolerable Scetches of two ſorts of the Cruſtaceous kind, I venture to ſend them you, ſince (tho much to the diſadvantage of their Beauty) they will give you a better notion of them than any thing I can write. Fig. V. and VI. ſhews them as they lye with their back towards you in a ſwimming poſture, but the Members and Legs on the other ſide are ſo various, and ſo much more curiouſly form'd than thoſe of Lobſters and Shrimps, that I deſpair'd of giving any tolerable repreſentation of them in any other poſition. Theſe are about the ſame ſize, the biggeſt being rather leſs than a very ſmall Flea, and the leaſt a little bigger than a Mite, but all are Breeders, and carry their Spawn at their Tayl, that of Fig. 5. in two Bags (one on each ſide) which are faſten'd about the 5th joynt, and the other in a ſingle Bag or Film under the Tayl, and I have often ſeen theſe Bags broken, and the Spawn (which is globular and large in the proportion to the Fiſh) ſcatter'd through the Water. There is alſo among theſe a third ſort of the ſame kind, not leſs elegant, tho far leſs in bulk, which is ſhap'd more like a Shrimp, and carries its Spawn like that, but I could never make any Figure of it worth preſerving; one thing I had like to have forgot which is very remarkable, that all theſe three ſpecies (as alſo ſome other Water Inſects) are certainly monoculus, and have their Eye exactly in the middle of their head, and I could never with my utmoſt application find ſo much as a dividing Line in it. Some of them, eſpecially in ſome Waters, are dark and cloudy, but they are generally ſo tranſparent, that through the Shell I can ſee the periſtaltick motion quite through their whole length, and a conſtant pulſation of a part, which I gueſs is the Heart, but I could never diſcover any courſe of Blood in them (nor even in Shrimps themſelves which are as large as ſome thouſands of theſe) tho I have ſeen it plainly in Creatures a little bigger, *viz.* the ſmalleſt new hatch'd Spyders, and in that Water Inſect which is deſcrib'd and pictur'd (tho not accurately) by *Swammerdam*, under the (very improper) name of *Pulex aquaticus.* But this is of the Teſtaceous kind, of which I have ſeen a greater variety (and not leſs curious) than of the Cruſtaceous; but 'tis too late to call a a new Cauſe.

July 5. 1703.

Dear Sir,

SInce my laſt, I have farther obſerv'd the *Lens paluſtris,* and am fully ſatisfy'd of the truth of its firſt ſpringing from the bottom. I lately took up ſome on the ſhallow ſide of a Pond, and found the ends of the Stalks (moſt of which were at leaſt 5 inches long, and as thick as a ſtrong Horſe-hair) manifeſtly radicated in the bottom, ſo that I could not take them up without raiſing the Mud with them, which alſo adhered very viſibly to them. Theſe Stalks or Roots are of a curious texture, and almoſt tranſparent, and I have ſeen their outſide very prettily cover'd with a regular ſort of Net-work. The Draught in the *Tranſact.* *No* 283. is very ſtiff, and ill repreſents them.

In my obſervation of theſe Stalks, I often ſaw adhering to them (and ſometimes ſeparate in the Water) many pretty branches, compos'd of rectangular oblongs and exact ſquares, which were joyn'd together, as you may ſee in Fig. VII which I drew as exactly as I could from one of them. There are often twenty or more of theſe Figures in one branch, which generally adheres at one end to the Stalks of the Plant, and I think it remarkable that theſe rectangular parallelograms are all of the ſame ſize, the longeſt ſide not exceeds $\frac{1}{3}$ of an hairs breadth, and that the length is juſt double the breadth, the ſquares being viſibly made up of two parallelograms joyn'd longwiſe. They ſeem very thin, and the texture of every one is nearly the ſame. To a very large Magnifier they appear as in Fig. VIII. I took theſe branches at firſt for Salts, but finding them always of the ſame ſize, and that there was no ſenſible encreaſe of their bulk while they continued in the Water, that after they had lain a day or two dry on a Glaſs Plate they alter'd not their Figure, and upon the addition of new Water (warm or cold) they had ſtill the ſame appearance and coheſion, and that their adherence (tho touching only in the angular points) was ſo firm and rigid, that all mov'd together, and kept the ſame poſition in reſpect of one another, however, agitated by the Water; theſe conſiderations, I ſay, perſwade me, that they may be rather Plants than Salts, but they being ſo very minute that no judgment can be made of 'em but by the Eye, I ſhall not determine any thing poſitively.

In ſome Water which I took out of a Pit, I found a ſmall Water Newte, not an inch long, which I ſuppoſe was of this years hatch, and the Legs being ſo ſmall as not readily to be diſcern'd at firſt view, and the body very clear, I took it at firſt ſight for a Fiſh. This I kept by me (in lieu of Tadpoles) to ſhew the circulation of the Blood in its Tayl. But that was not the only entertainment it gave me, for I found the courſe of the Blood in every part of its Body, and particularly in every digit of the Feet, it was a curious ſight to obſerve the Stream come to the extremity of the Toe in one Channel, and return by another. In this Newte juſt below the ſetting on of the head on each ſide are three little rugged fleſhy branches, which he ſpreads like Fins, and which help to poiſe his Body. Obſerving theſe with the Microſcope, I found each of them divided (ſomething like a Leaf of Polipody) into a great many pointed branchings, in each of which (as in Toes) I can ſee the Blood come to the extream point on one ſide, and return on the other; and this is the more entertaining, becauſe 30 or 40 of theſe branchings will ſometimes appear at one view, and the Blood ſeen diſtinctly circulating in all. For as Mr *Cowper* rightly obſerves, the Globules of the Blood of theſe Creatures are very large, ſo that I can ſee the Circulation in them very well, even with the ſmalleſt Magnifiers, which take in a great *Area*. And from what has been ſaid of this courſe of Blood, I am perſwaded, that theſe Organs in the Newte are not only deſign'd to be ſerviceable in their Swimming, but (tho they have Lungs like a Frog) may be alſo Analogous to the Gills in Fiſhes.

In my examination of the Waters of our Ditches (in which I daily find new varieties of *Animalcula*) I had the good luck to meet with great numbers of thoſe round Bodies, mention'd by Mr *Leeuwenhoeck* in the *Tranſactions*, No 261. *Anno* 1700. which are there ſo well deſcribed, that I ſhould not have again ſpoke of them, only that I ſaw a very ſurprizing Phœnomenon while I was obſerving them. Each of theſe ſpherical Bodies (which are ſmaller than a Muſtard Seed) have a conſtant progreſſive motion, and at the ſame time a ſlow revolution about their own axe, and contain within them other ſmall Globules, ſome more, ſome leſs, but I never found above 10 in any one, and theſe I have ſeen move and change their poſition within the other, which Mr *L.* ſays he never obſerved. While I had one of theſe Bodies on a Glaſs plate before my Microſcope, I ſaw (as he deſcribes it) one of the contain'd Globules ſlip out of it, and while the great one lay ſtill, for want of ſufficient depth of Water to float in, this little one that came out had immediately a very quick rotation on its axe; and what was moſt ſurprizing, at the ſame time it kept an equable revolution about the bigger Globe as the center of its Orbit, always very nearly at the ſame diſtance, tho I could not perceive any Vortex in the Water which bore it; and what is yet more remarkable, I ſaw it ſtop, and then make its revolution round the central Body the contrary way, the rotation on its own axe always continuing. And when the Water was ſo far evaporated that all lay at reſt, by the addition of new Water the ſame motions were renew'd. This I thought a very pretty repreſentation of the Planetary motions about the Sun, and I doubt not but a *Carteſian* Philoſopher would not have been a little pleas'd, to ſee in Nature ſuch an inſtance of ſuch revolutions of an inanimate Body in ſuch a medium as Water. Indeed I think it not eaſy to account for theſe motions of theſe Globules, nor will I to ſolve the difficulty ſay in contradiction to Mr *Leeuwh.* that I believe them Animate, tho I have formerly ſeen ſome not very unlike them both in ſhape and motion, which I am ſatisfy'd are Animals. But of thoſe (among other things) I laſt year gave an account to Sir *Ch. Holt*, which I hear will ſhortly be publiſh'd in the *Tranſactions.*

I can at preſent think of no other Obſervations of this kind to fill up my Paper, unleſs you ſhould think it worth your notice, that I find all the Earwigs which I have examin'd by a Microſcope, infeſted with great numbers of minute Inſects, which ſtick like Lice on many parts of their Bodies, and eſpecially juſt under the ſetting on of their Head. They are alike on all, and I never found the ſame on any other Animal, they are white and ſhining like Mites, but much ſmaller, are round back'd, flat bellied, and have long Legs, eſpecially the two foremoſt.

II. *Part of two Letters from Mr* Stephen Gray, *concerning the Spots of the Sun, obſerv'd by him in* June *laſt.*

SIR,

SPots in the Sun being ſo rarely ſeen, I preſume it may not be unacceptable to you or ſomeothers of the Royal Society to hear of one that has been obſerved by me this preſent *June*, tho it have at this time left the Suns viſible Disk, yet by the ſequel of this account, you will find it may probably return in a few days.

June the 15th, 1703. between 4 and 5 a Clock in the Afternoon I ſaw a Spot in the Sun, by placing a white Paper ſo far behind the Teleſcope of 6 Foot, as to give the image of the Sun 9 inches diameter; the Spot was in the lower Right hand Quadrant of the Suns Disk, its form was almoſt round, inclining to an Ellipſis, it was diſtant from the limb of the Sun about 6 or 7 minutes, and its diameter I judg'd to be about 10 or 12 Seconds, a little before the Sun ſet I ſaw the Spot with a 16 Foot Teleſcope, and could perceive that it was environ'd with a Miſtineſs; the 16th I ſaw the Spot again about 2 in the Afternoon, and found it advanced nearer to the Weſtern limb of the Sun, but the 17th was Cloudy, and ſo was the Night, which hinder'd me from obſerving the Eclipſe of the Moon; the 18th in the Afternoon it clear'd up, and a little before 5 I ſaw the Spot with the 16 Foot Glaſs through thin Clouds, and found it was now very near the limb of the Sun, little more than half a minute, 'twas much contracted in its breadth, ſo as to be 4 or 5 times longer than broad, the 19th in the Morning I look'd for it again, but could not ſee it, ſo I concluded it was then either gone off the Disk of the Sun, or if it adhered to the limb, the great Tremulation of the Atmoſphere hinder'd me from ſeeing it.

Aſtronomers have by theſe Spots found, that the Sun revolves on its Axis, ſo as that in 27 days the ſame point in the Suns Disk returns to the ſame place ſeen from the Earth, hence its Semirevolution in 13½ days, and conſequently the Spot going off the Suns Disk, the 19th of *June* may be expected to return the 2d of *July* next to the Eaſtern limb of the Suns viſible Hemiſphere, if it be not diſſolved before that time. I have in the following Figure endeavoured to expreſs the appearance, but had not the conveniency of meaſuring the angle of the Spots way, with the Vertical, which is only gueſs'd at.

June the 26, 1703. In the Evening I look'd to ſee whether there were generated any new Spots in the Sun, but found none; but on the 27th about half an hour after 8 in the Morning, by receiving the Suns image on white Paper from the 6 Foot Glaſs, I ſaw a Spot near the Vertical of the Sun towards the lower limb, betwixt 9 and 10 I elevated the 16 Foot Tube, the Clouds now being of a convenient thickneſs to let me ſee the Sun without prejudice to my Eyes, and found that this Spot was of a triangular form, and that it was accompanied with 2 other leſſer ones, as is expreſt in Figure the 1ſt, the ſides of the great Spot were curvilinear, this with 2 leſſer ones made an Equicrural Triangle at 4 in the Afternoon the Triangular Spot had a ſmall fragment ſeparated from it, and it ſelf was now become Elliptical, the Spot b. d. was much augmented, but the Spot c. diminiſhed, and become longiſh, as in Figure 2, at half an hour after 5 the fragment from the great Spot was it ſelf divided into 2 and the Spot c. was ſo narrow as ſcarce to be ſeen, as at Fig. 3, at 6 a Clock, and 30 minutes there was a ſmall fragment ſeparated from the lower end of the great Spot, as at Figure 4, at 7 a Clock the Spot b. was much encreas'd, but c. was vaniſh'd; the obſervations made this Afternoon with the 16 Foot Glaſs, were when the Air was clear and ſo to ſecure my Eye, the Eye Glaſs was ſmoak'd with a Wax Candle.

The 28th about 7 in the Morning, I ſaw that the great Spot was much augmented, but the leſſer ones that yeſterday attended it, were vaniſh'd, and that there were two new ones generated at about 1 ½ minutes diſtance from the great one below, and towards the left hand of it the great one was a paralellogram, with a very black diagonal croſſing it, ſee Fig. 5. at 10 a Clock there was another diagonal croſſing the former, and the two leſſer Spots which before were longiſh, had now taken a round form, the Spot c. being much larger than the other at b.

I am not yet furniſh'd with proper Inſtruments to find the poſition of the Suns Spots, with reſpect to Longitude and Latitude on the Suns Disk, ſo I contented my ſelf with obſerving the poſition and variation of the Spots among themſelves, which afforded me a moſt ſtrange and wonderful variety.

III. *Some Obſervations on the Spots of the Sun, by the reverend Mr* William Derham, F. R. S.

Explication of the Figures.

THe two Circles repreſent the Suns Disk, and N. the Northern part thereof, S. the Southern, E. the Eaſtern, and W. the Weſtern part.

The place of the Spots, and the manner of their Appearance every day, is repreſented with the day of the Month on the Sun's Disk.

But I deſire it may be obſerved, that altho the Figures of the Spots are done pretty exactly, yet their places on the Sun are not ſo, for being unprovided with convenient

Inſtruments for the purpoſe, I could not exactly ſet off their delineations, nor their diſtances from the Suns limb, but was forc'd to repreſent them only as well as I could, by taking the ſpecies of the Sun upon Paper through a Teleſcope, and ſo marking out their places.

But ſince the laſt appearance of the Spots, I have invented, and have provided my ſelf with an exceeding nice Micrometer, and a Watch that beateth half Seconds, hoping to have been able to have ſeen another Revolution of them.

My Micrometer is not as uſually, to be put into a Tube, but is to meaſure the ſpecies of the Sun on Paper (of any *Radius*) or to meaſure any part of it, which I am inclin'd to think is more exact than the common way. By this means I can eaſily, and very exactly, with the help of a fine thread, take the declination of a Spot at any time of the day; and by my half Seconds Watch, and a fine croſs-hair (which latter way I learnt from my Friend Mr *Flamſtead*) I can meaſure the diſtance of the Spot from the Suns Eaſtern or Weſtern Limb.

This croſs fine Hair, I adviſe, from my own experience, ſhould be ſet, not at the exact focal diſtance from the Eye-Glaſs (as uſually) but a little out of that diſtance, nearer towards the Object-Glaſs, becauſe the ſhadow of the Hair will be thereby much narrower, and more ſtrongly appear croſs the ſpecies of the Sun receiv'd on the Paper, which I take this occaſion to note, not only becauſe I believe it hath ſcarcely ever been before obſerv'd, but becauſe it may be of good uſe in taking the Suns altitude, meaſuring his diameter, *&c.* this being a more eaſy, and perhaps a more exact way, than by looking through the Tube.

Being thus provided, if I could have ſeen another Revolution of the Suns Spots, I ſhould have been able to have given the Society a more accurate Account of their Poſition and Motion. But I hope it hath been done by ſome others, and that their more accurate Account may render this of mine uſeleſs. And this I the more earneſtly wiſh, becauſe I have now little hopes of mending my defects, by reaſon the Spots are all quite gone off. They ſeemed ſtrong enough to have laſted another, or more Revolutions, but none have been viſible ſince the ſixth of this Month, on which day I think I had a glimpſe of a Spot on the Suns Weſtern Limb, about 7 of the Clock in the Morning.

The appearances of the Spots, being in the Figures above, ſet with every day of the Month, I need ſay but little, only take notice of a few things that the Figures do not ſo well expreſs.

The Spot in Fig. 1. was as repreſented, *viz.* 1ſt round and ſtrong, afterwards long, and with a *Nucleus*. The very ſame Spot (I doubt not) I ſaw again on the Suns Eaſtern ſide on *July* 5, but very faint, ſmall and long (as in Fig. 2.) ſo as to be but juſt diſcernible. On *July* 6 it quite diſappeared, both through my Tubes, and on Paper, which is better.

The Spots in Fig. 2. had theſe remarkable appearances and variations. On *June* 28. viewing the Sun towards Evening, I eſpy'd a large, ſtrong dark Spot, with two or more glaring *Nubeculæ* behind it, ſomewhat like the repreſentation in the Figure. Theſe the next day were become four ſtrong dark Spots, the foremoſt with a tail to it, conjoyning the little Spot next it, as in the Figure. On *June* 30. I ſaw Spots, but it being a cloudy morning, and I abſent from my Tubes in the afternoon, the Repreſentation of them in the Figure is not exactly as they were. *July* 4. between two long Spots appeared ſomething like a round *Nubecula*, as in the Figure. The reſt as in the Figures.

Thus, for want of a better from others, I have given the beſt account of the late Solar Spots. The ſingle Spot in *June* may be ſeen to have paſſed above half over the Disk before a very good Friend of mine gave me notice of it. And that or ſome others were, I hear, ſeen in

May: but it was not my fortune to ſee them ſooner; which if I had, I might have been able probably to have made my account better. But notwithſtanding it is imperfect, it may, I hope, introduce better from others: or however be a teſtimony of my great Veneration for the Auguſt Royal Society, and obedience unto the commands thereof, who at one of their Meetings ſome time ſince, were pleaſed to deſire me to procure, or give an account of this matter.

IV. *Some Obſervations concerning the Invention and Progreſs of Printing, to the Year* 1465. *Occaſioned by by the Reverend Mr* Ellis's *Letter, exhibited in* Phil. Tranſ. *No* 286. *Pag.* 1416.

WHat this Gentleman ſays about the Books Printed at *Harlaem* by *Laurence Koſter*, agreeing ſo well with the account given by *Theodore Schrevelius* and others, leaves us little or no room to doubt (who muſt needs take it for granted that his Obſervation is accurate, and the *Dates* to be true;) whether the Honour of the Invention be due to *this* or the other Cities, whoſe Writers have ſo eagerly contended for it; ſince none of them have pretended to ſhew any Book Printed ſo ſoon as *A. D.* 1430 or 1432, or near that time. But the difficulty lies, either in ſhewing why the Practice of this Art ſhould be at a ſtand from *A. D.* 1432. to the noted Reviving of it at *Mentz* by *John Fuſt* and *Peter Schoeffer*, who (as it has been vulgarly, but erroneouſly ſaid) did Print the firſt Printed Book there *A. D.* 1465. namely, *Tully's Offices:* or elſe, in giving any tolerable account of the Progreſs of this Invention during an Interval of above 30 years.

Boxhornius (as I remember) as well as *Schrevelius* and other Authors, do expreſsly ſay, (and if they had not, it might well be imagin'd) that *Koſter* could not advance this Invention ſo far, as to Print ſo large a Work as the *Speculum Salutis* without gradual Improvements; and that his firſt Eſſays were on looſe and ſmall *leaves* of Paper, before he attempted *whole Books*. Theſe being looſe and ſingle, are ſuppos'd to be all loſt : but I once obſerv'd a looſe leaf of Paper *in Octavo*, lying in an old MS. *Breviary* in her Majeſty's Royal Library at *St James's*, which I then thought (and am ſtill in the ſame opinion) that 'twas one of *Koſter*'s firſt Pieces ; done when he had attain'd to ſome Experience in the Art, and to get Money. 'Tis a little rude Wooden Cut, of the five Wounds of our Bleſſed Saviour, and the Inſtruments of his Paſſion, with a *Latin* Inſcription at the bottom, to this purport, that Thoſe who ſhould ſay ſo many *Ave Maria's* before it, ſhould have ſo many thouſand years of Pardon. In this Cut or Print, the Ink which made it was *Writing Ink*, and 'twas all Black, without thoſe other Colours with which *Koſter* ſeems afterwards to have adorn'd his Books.

In the abovementioned *Boxhornius*'s Book *de Origine Artis Typographicæ*, 'tis ſaid, that *Hadrianus Junius* had a Book Printed by *Koſter*, and like that kept in the Cheſt at *Harlaem*: Now amongſt thoſe Bequeath'd to the *Bodleyan Library* at *Oxford*, by Mr *Francis Junius* (who was a Kinſman of *Hadrian*'s) there is a thin Book in a ſmall Folio (Numbred 31.) which may probably be the ſame; and which Mr *Foſs*, a learned and curious *Daniſh* Gentleman, did aſſure me was very like to that at *Harlaem*. This contains the Sum of the *Hiſtory of the Old Teſtament*, all repreſented in rude Wooden Cuts, colored with divers colors, without *Shadows*, like to our *Cards*, (which, with *Sheet-Ballads*, are remains of the old manner of Printing,) and Stamp'd upon one Side only ; the white ſides of two Leaves being paſted together; the Black both in the *Pictures* and *Inſcription*: which ſhew the meaning of them, being * *Writing Ink*, (as the aforeſaid Leaf) inartificially ſpread upon the Wooden Block; here thick, there thin; ſpreading and yellowiſh; the Letters extreamly rude, and all together manifeſtly ſhewing that the Art was yet in its Infancy. The Stamping of this Book on one Side only, was not (as ſome think) becauſe the *Printer* did not know how to diſpoſe the Pages in ſuch manner, as might be proper and eaſy for the *Book-Binders* uſe; for it has its *Signatures* all along in *Minuſcule Letters*, (ſet in the middle of the Page, which is remarkable;) but becauſe it was thought that the Paper would not bear a ſecond Impreſſion on the back ſide; juſt as the *Book-writers* of thoſe times (when Paper began to be cheap, and to be made up into Books) would yet have the firſt and laſt Leaf of each *Quaternio*, *Senio*, &c. to be of *Parchment* for ſtrength's ſake. This Book (as I remember) is imperfect, and has no *Date* now appearing, and perhaps never had any; neither has ſuch another Book as this, which contains the *Hiſtory of St John and the Apocalypſe*, in ſuch like wooden coloured Pictures and Inſcriptions. This is inſcribed *L A V D. E. 65.* in the ſame *Bodleyan Library*, and has its *Signatures* alſo in *Majuſcule Letters* (as indeed I have obſerved *Signatures* in many MSS. of different Ages, as high as 1000 years ago and upwards, expreſſed either by *Letters* or *Numbers*.) This Book, tho Printed on one Side, and Paſted as the former; is yet more elegant, and ſhews that the Art was much improved. And here it may not be impertinent to obſerve, that in the ſame Library (*Arch. B. Bodl.* 88.) is an antient MSS with the ſame *Figures* and *Inſcriptions*, tho the *Habits* of the Figures be different, thoſe of the MS being of the older Faſhion, and 'tis very likely that there is another Copy of this Book in the *Emperors* Library at *Vienna*; for *Lambecius*, *Comment. de Biblioth. Caſ. Lib. II. Pag.* 772. reckons amongſt thoſe which he brought away from the *Archi-ducal* Library at *Inſpruck*, a Book of which he gives this Account, *Apocalypſis S. Joannis Apoſtoli & Evangeliſtæ Latino-Germanica, chartacea in folio, una cum Vita ipſius, & multis figuris ligno inciſis, quæ propter vetuſtatem ſuam ſpectatu ſunt digniſſimæ*, and in this Book at *Oxford*, beſides the Printed Cuts, alſo a *Commentary* upon the *Apocalypſe* in *High-Dutch*. Beſides theſe two moſt antient Printed Books, Mr *Bagford* told me that in the *Manuſcript Library* of *Corpus Chriſti* or *Bennet College* in *Cambridge* he ſaw a third, containing the *Hiſtory of our Saviour*, Printed on one Side only of the Paper, with ſuch like Wooden Cuts; but yet more neatly than either of the former, which I had before ſhewn him at *Oxford.* And theſe three Books, being as is before ſaid, Stamp'd but on *one ſide* of the Leaf; the whole *wrought* or *cut upon Wood*; not *Set* or *Compoſed* with *Printing Letter*; and Printed with *Writing Ink*; do ſufficiently demonſtrate that the Art was as yet in its Infancy; and may, tho they bear no Workmons Name, be very reaſonably aſcribed to *Koſter*, not only becauſe no body elſe lays claim to 'em, but becauſe in divers Circumſtances they agree with the Hiſtory of the Man, and with what remains of his Workmanſhip. If it be asked why *Koſter* did not ſet his Name, and the Year to theſe Books, as well as to that at *Harlaem*, mentioned by Mr *Ellis*? It may be anſwer'd, that *Schrevelius* tell us that *Koſter* bound *Fuſt* abovementioned, by Oath to ſecrecy, and not to betray the Art to any perſon whatſoever. Wherein 'tis likely, that his deſign was not ſo much to let the World think, that he had a new way of multiplying the Copy of a Book much quicker than the quickeſt Penman; but that he deſigned to Impoſe upon the World, by ſelling his *Printed Books*, for New-Written Copies, whereby the *Book-Writer* and *Illuminator* muſt (as he might well pretend) be ſo paid for their Work, as to maintain themſelves and Families. This Trick might be long undiſcovered in and about *Harlaem*, becauſe there was no other Printing, whereby this might be condemn'd; but at length, as *Boxhornius* and *Schrevelius* write, *Fuſt* ran away with all his Maſters Tools and Materials, and in Proceſs of time ſet up a Printers Shop at *Mentz*, being aſſiſted by his Servant *Peter Schoeffer* (a Young Man of a good Genius) who afterwards Married his Daughter, and became his Partner in the Buſineſs. The Story goes, that this *John Fuſt* went to *Paris* (but whether before or after his ſettling at *Mentz*, I cannot tell :) and that he there offer'd a great number of *Printed Bibles* to ſale, as if they were *Manuſcripts*. But the *French* were not to be ſo caught. They conſidered the number of theſe Books, and their exact conformity to one another throughout the whole, to a Line, a Word, a Letter, a Point, and that the beſt of *Book-Writers* could not be thus exact, and therefore by Indicting him of *Diabolical Magic* (or threating him with it) they at once gave birth to the Story of *Doctor Fauſtus*, and cauſed him to diſcover the Art. And I doubt not but about this time, very many Books were Printed and Sold for Manuſcripts, I having ſeen divers ſuch Books without Dates, which look'd rather older than any I have ſeen with them. I ſpeak now of thoſe that are Set or Compos'd of *Letter*, which with *Printing-Ink* of Lamp-Black and Oyl, and the *Printing-Preſs*, is ſaid to be the Improvement of *Schoeffer* above-mentioned, tho *Schrevelius* with leſs reaſon aſcribes the two former to his Countryman *Koſter*.

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* It is to be wiſh'd that Mr *Ellis*, when he had *Koſter's* Books in his Hands, had obſerv'd whether the *Black Ink*, was *Printing Ink* or not; whether *Koſter's* Picture was antient, and colour'd or not; or if there were more in either of the Books; whether the whole was Cut upon Wood, or Compos'd with *Printing Letter*; whether there were *Signatures* for the *Book-Binders*, &c.

When *Fuſt* and *Schoeffer* began firſt to Work at *Mentz* is uncertain, but the firſt mention I find of him, as a Printer at *Mentz*, is in *Schrevelius*, *Harlem pag.* 272. where he ſays that this *Fuſt* (or *Fauſtus* as he calls him) publiſhed *Alexandri Doctrinale cum Petri Hiſpani tractatibus A. D.* 1442. but this and ſome other Books mentioned by Writers on this ſubject, are never ſaid to be extant in any *particular place*, in order to be *conſulted* upon occaſion; and therefore their *Titles* and *Dates* are not ſo much to be relied upon. But another Date, which thō not ſo *Old*, is more *Authentic*, may be found in the above cited Book of *Lambecius*, Pag. 989. where he ſays he brought away from *Inſpruck* amongſt other choice Volumes, and placed in the *Imperial* Library at *Vienna*, a Pſalter Printed upon *Parchment*, with this Inſcription at the end, *Præſens Pſalmorum codex venuſtate Capitalium decoratus, Rubricationibuſq; ſufficienter diſtinctus, adinventione artificioſa imprimendi ac characterizandi, abſque calami ulla exaratione ſic effigiatus, & ad euſebiam dei induſtrie eſt conſummatus per* Johannem Fuſt, *Civem Moguntinum & Petrum Schoffer de Gernszheim, anno Domini milleſimo* CCCCLVII. *in Vigilia Aſſumptionis*. From this time there are conſtant Remains of the Induſtry of theſe Men, and I can mention more Books Printed by them, than the *Durandus* (in the Library of *Baſil* in *Switzerland*) Printed (as a Gentleman who ſaw it, told me) *A.* D. 1458. *Joannes Joanuenſis*'s *Catholicon* (in her *Majeſty's* and the *Lord Biſhop* of *Norwich*'s Libraries,) Printed 1460. The *Latin Bible* of 1462, yet extant in the *French Kings* Library, and in divers *Monaſteries* beyond the Seas, and perhaps in *England*. The *Tully's Offices* Printed both in 1465 and 1466, (if both theſe be not the ſame Edition, the *laſt Sheet* or *Leaf* being Compos'd afreſh :) and ſo on till *Schoeffer* work'd for himſelf after the Death of *Fuſt*, and *Schoeffer*'s Poſterity after him. But I willingly forbear the Catalogue, in hopes that this, with that of the other *old Printers* throughout *Europe*, and eſpecially of our *Engliſh Workmen*, with their *Devices*, the *Effigies* of moſt of them, and a multitude of uncommon Remarks relating to *Writing*, *Printing*, *Parchment*, *Paper*, *Binding*, &c. will be communicated to the World, when *Mr Bagford*'s Papers ſhall be digeſted ; nor do I think it ingenuous or honeſt to prevent him in theſe his Labors, which have coſt him ſo many Years Pains.

A word or two more I take leave to add, that upon the firſt diſcovery of the Art by *Fuſt* at *Paris*, or at his firſt

Settlement or publick Profeſſion of it at *Mentz*, it quickly ſpread over the beſt parts of *Europe*, * and was commonly uſed in *other Countries* before 'twas known in *England* (notwithſtanding what ſome Writers do affirm to the contrary;) the firſt Book that we pretend to have been Printed here, being *Hierome* (or rather *Rufinus*) on the *Creed*, Printed at *Oxford*, *A. D.* 1468.

From theſe *Places*, and from Books, or parts of *Books*, where, or wherein ſuch ſorts of *Letter* was uſed, the *Printers* do ſtill call their *Letter*, *Italick*, *Roman*, *Engliſh*, &c. *Auſtin*, *Canon*, *Pica*, *Primer*, *Brevier*, &c.

To prove this in ſome meaſure (not to mention the progreſs of *Printing* in other Countries) I inſtance in *Italy*, and particularly *Rome*. Here, not to inſiſt on the large Catalogue of *Printed Books* deſcribed in an Epiſtle to Pope *Xyſtus* IV. Publiſhed at the beginning of the *V. Tome* of the *Bible* printed with *Lyra's Commentaries* at *Rome*, *A. D.* 1472, and tranſcribed by *Boxhornius*; I ſhall only relate the ſum of what I meet with in *Bernard Mountfaucon's Diarium Italicum*, *Tom.* 1. *page* 255, 256. 'Tis that *Joannes Alerienſis, in a flattering Epiſtle to Pope Paul* II. (who was elected *A. D.* 1464.) *congratulates him, becauſe Printing was firſt us'd at* Rome, *under his Pontificat.* Which if ſpoken of the very firſt practice of the Art at *Rome*, and not of an eſtabliſhed Imprimery, ſeems to be falſe, becauſe this learned Monk, in the ſame place, ſays *he ſaw a Lactantius in the Muſæum* (or Study) *of Monſieur de la Thuilliere, which has theſe words at the End, Lactantii Firmiani Inſtitutiones cuſæ in venerabili Monaſterio Sublacenſi anno* 1461. *antepenultima Octobris.* Now unleſs a man will ſuppoſe Printing to be invented in this Monaſtery, he muſt believe it to be brought hither from *Rome*, which is but about 20 Miles diſtant from it. And the ſame Author ſays, *that Floravantes Martinellus in his Roma Sacra, affirms that Printing was practiſed at* Rome *in the Palace of the* Maximi, *A. D.* 1455, *under Pope* Nicolaus V. *by* Conrad Sweynheim *and* Arnold Pannartz, who were both *Germans*, and continued *Printers* there for many Years after.

The Cuſtom of putting the *Dates* of *Printed Books* at the *End* of them, was taken up in Imitation of divers the middle-aged and recenter Manuſcripts (for I never ſaw or heard of any antient Manuſcript in *Capital Letters*, either *Geeek* or *Latin*, which has a *profeſs'd Date* written in the *firſt hand*;) but here the Inſpector ought to be cautious, leſt he be led into an Error: For ſeveral Manuſcripts at the End have a Date, which may be by ſome underſtood of the time when thoſe individual Copies were *written*, whenas they only notifie the time when the *Author finiſh'd his Work.* And ſome of theſe Dates, being printed from the Manuſcripts, have deceived many curious men. For Example, the firſt Edition of *Lyndwood*, *Paulus a Sancta Maria*, and others which I could name. Beſides, ſome Dates in antient Printed Books, being not corrected, are falſe; ſuch as a Book printed in the beginning of the 16th Century, in the Library belonging to the *Aſhmolean Muſæum* at *Oxford*, which thus pretends to 400 or 500 years of Age. A *Julius Hyginus* once ſhewed to me by Mr *Millington* the Bookſeller, printed at *Paris* (as there put down) *An. Dom.* MCCCCXII. inſtead of MCCCCCXII. For the Printer is mention'd as then living in *l'Origine de l'Imprimerie de Paris.* I have indeed a Book wherein, amongſt other Tracts, is one of an old Print, at the end of which there ſeems to be ſuch a Miſtake, tho not ſo eaſily rectified as the former. The words are theſe, *Explicit opuſculum* Enee Sylvii *de duobus amantibus in Civitate Leydenſi Anno Domini Milleſimo* CCCC *quadrageſimo tertio* LEIEN. Now tho' *Leyden* ſeems to be the place *where* 'twas printed, yet 1443 cannot be the time *when*; for juſt before *Sylvius* ſays himſelf, *Vale, ex Vienna quinto Nonas Julias Mo* CCCC *quadrageſimo quarto:* *Sylvius* was elected Pope by the name of *Pius* I. *A. D.* 1458, and died *A. D.* 1464. Now it may ſeem probable, that if this Tract was printed after his Election (as ſuppoſe *A. D.* 1463.) or even after his Deceaſe, his Papal Dignity might have been remembred; If it be judg'd to have been printed before his Election, I know none that will allow of Printing at *Leyden*, (or even in *Lyons*) ſo very early.

One Objection may be urg'd againſt what is ſaid of *Koſter's* or the old printed Books above-mentioned, being printed upon Paper about *A. D.* 1430, or ſoon after. For ſome Authors are of opinion, that Paper made of Linnen Rags was firſt made at *Baſil*, by ſome *Greeks* who fled out of their Country after the Saccage of *Conſtantinople*, *A. D.* 1452. in Imitation of the *Cotton Paper*, commonly uſed in the *Levant*. But this can have no force, our Paper being much older: For I have a piece, the Writing upon which ſeems to be about 350 years old, and agrees very well with a Charter which I have ſeen of *Thomas Beuchamp* Earl of *Warwick*, bearing date *A. D.* 1358. and 32 *Edw.* III. In the Archives of the Library belonging to the RR. Dean and Chapter of *Canterbury*, I ſaw an Inventory of the Goods of *Henry* Prior of *Chriſts Church* there, taken upon his Deceaſe, (as I remember) the 20th year of K. *Edward* III. and this is written upon *Paper*. In the *Cottonian* Library, tho' ſearching after other matters, I could not but obſerve ſeveral Writings upon our *Paper*, in the time of moſt of our Kings and Queens, as high as the 15th of K. *Edward* III. and I doubt not but that there are others more antient in the ſame place. But in the *Eaſt*, the uſe of *Cotton Paper* is much more antient, and I have in the *Bodleyan* Library, ſeen an *Arabick* Manuſcript (amongſt thoſe which the Univerſity bought of Dr *Huntington*) written in the 427th of the year *Hegira*, i. e. *A.D.* 1049, and others in the ſame place, without Dates, ſeem older.

The Proximity of the ſubject, cauſes me here to take notice, that tho the Invention of the *Rolling Preſs* is commonly aſcribed to *Lipſius*; yet it ſeems older than his time, from a printed Book in the *Bodleyan* Library, placed LAVD. D.138. This is a *Miſſale ſecundum uſum Eccleſiæ Herbipolenſis* (i. e. *Wurtzburg in Germany*.) *Rodolfus* Arch Biſhop of that Church ſets forth in an Inſtrument at the beginning of the book, the reaſons why he cauſed this Miſſal to be publiſhed, which Inſtrument

ment bears date the 8th of *November* 1481. by which time he orders all the Copies to be finiſhed by *Jorius Ryſer* his Printer, who ſeems to have done ſo, ſince his Name, and this Year 1481, is written at the end of the Book. Inſtead of a Seal to this Inſtrument is an *Engraven Print*, being the *Arms* of the *See* ſupported by 2 Angels, and St *Kilian* (its firſt Biſhop and Protector) behind; as alſo this Prelate's own Arms with thoſe of the *See* in another *Eſcutcheon*, and a very fine *Mantling.* This is extremely well engraven for the time, and equals the performances of ſome of our beſt Workmen at preſent. The evident marks of *preſſure* by the *Plate*, with ſome touches of *Ink* at the *Edges*, the *roughneſs* of the Print, and other Circumſtances concurring, I thought this muſt needs be wrought off at the *Rolling-preſs*. But being unwilling to rely too far upon my own Judgment, I ſhewed it to divers very knowing and curious Gentlemen, to ſeveral *Printers*, *Engravers*, and others working conſtantly at the *Rolling Preſs*, who all concurr'd (tho at different times, one not knowing what another had ſaid) that 'twas not only excellently well engraven (and this before *Albert Durer*'s time) but that it was certainly pull'd from the *Rolling-Preſs*, and could be done no other way. And that this Print was not done after that time, appears from ſeveral Notes written here and there in the Book. One of them ſpecifies that *William Kewſth*, Vicar of St *Bartholomew*'s Church in *Wurtzburg*, bought this Book the ſame year, 1481, paying 18 *Florins* for the *Parchment*, *Printing*, *Rubrication*, *Illumination* and *Binding.* By another it appears, that he gave it to his Church for ever. And by ſome others it appears that it remained there during the times of his ſeveral Succeſſors, till the laſt Age, when, as I ſuppoſe, the *Swedes*, under *Guſtavus Adolphus*, plunder'd the Church, and brought it out.

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FINIS.

ADVERTISEMENT.

THere having been lately Propoſed by Subſcription, Mr *RAY*'s third and laſt Vol. of his *HISTORY* of *PLANTS*, whereby that whole Work is compleated, containing more Plants, and Deſcription of new *Species*, than all the Books yet extant on that ſubject; many hundreds being communicated from the Streights of *Magellan*, the *Philippine Iſlands*, and ſeveral Countries never ſearched of Plants before. By *F. Georgio Camelli* and other *Virtuoſi*, who either reſide, or have made careful remarks in the reſpective places; all diſpoſed in an eaſy method, to be found by their Tribes and Characteriſticks; with an account of ſuch parts of them as are either Specificks for ſome Diſeaſes, as the *Peruvian Bark*, *&c.* or are Univerſal Medicines, as *Faba St Ignatij*, *&c.* beſide many peculiarities belonging to particular Plants, every where occurring in the Work. The ſame is already far advanced at the Preſs, and will be finiſhed about the 25th day of *March* next, by the Undertakers *SAM. SMITH* and *BENJ. WALFOD*, Printers to the Royal Society, at the *Prince's Arms* in St *Paul*'s Church-yard.

BRITISH MUSEUM NATURAL HISTORY

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